

ISSN 0970 - 4086

Āryavaidyan

लाभानां श्रेय आरोग्यम्

*Of all the gifts,
the most precious is health*



Vol. XIX, No. 1
August - October 2005



A QUARTERLY JOURNAL OF
THE ARYA VAIDYA SALA - KOTTAKKAL

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FROM THE PAGES OF VĀGBHĀṬA - LXIX

P. Madhavikutty*

Abstract: Śārīra (body) is the abode of puruṣa (the living being). The apt union of pañcamahābhūtas and cētana (consciousness) is termed as puruṣa. Any disease, may it be due to physical or mental causes, manifests itself through deranged body functions. So, a student must attain a thorough knowledge of the basic components of śārīra and its normal functions before starting study about diseases and treatment. Śārīrasthāna, the second section of Aṣṭāṅgahṛdaya begins with this issue. Here, the discrepancies regarding śukḷa, ārtava, ṛtumati, ṛtukāla, etc. are dealt with in detail.

Now we have to deal with Śārīrasthāna, the second section of Aṣṭāṅgahṛdaya. Śārīra (body) is the abode of puruṣa (the living being). According to Caraka the apt union of pañcamahābhūtas and cētana (consciousness) is termed as puruṣa who is the beneficiary of ayurveda. It is created and elucidated for his sake.

Any disease, may it be due to physical or mental causes, manifests itself through deranged body functions. So before starting to study about diseases and treatment, the student must attain a thorough knowledge of the basic components of śārīra and its normal functions. This was very well recognized by our ācārya Vāgbhāṭa. So unlike other ācārya, he included these studies of anatomy and physiology in the second section of his treatise Aṣṭāṅgahṛdaya.

अथातो गर्भावक्रान्ति शारीरं व्याख्यास्यामः ।

इति ह स्माहुरात्रेयादयो महर्षयः ।

(Athātō garbhāvakrānti

śārīraṁ vyākhyāsyāmaḥ ।

iti ha smāhurātrēyādayō maharṣayaḥ ।)

Now we shall comment on the chapter Garbhavakrānti śārīra (the formation of pregnancy); thus spoke the sage Ātrēya and other ācāryas.

शुद्धे शुक्लार्तवे सत्वःस्वकर्मक्लेशचोदितः ।

गर्भः सम्पद्यते युक्तिवशादग्निरिवारणौ ॥ १ ॥

(Śuddhē śukḷārtavē satvaḥ

svakarmakḷēśacōditaḥ ।

garbhaḥ sampadyatē

yuktivaśādagnirivāraṇau ॥ 1 ॥)

Śukḷa and ārtava = Śukḷārtava, refers to male and female bīja or seeds. Through the proper mating of healthy couple, when the śukḷa and ārtava join together, and the satva (jīva or prāṇa) impelled by its own pre-destined afflictions gets into this union in an orderly

manner, then occurs the origin of garbha (embryo) just like the origin of agni (fire) from the friction of two pieces of araṇi (agnimandha-*Premna corymbosa*).

Before describing the next śloka, it is better to refer to the confusion that has ensued from the use of the words śukla and ārtava in this context. In fact many inaccuracies and misunderstandings have inflicted the current studies of śārīra in ayurveda. The worst affected is the garbhavakrānti śārīra itself. These improprieties start right in the explanation of the above-mentioned śloka. The explanation is: शुक्लं अन्त्ये धातुः ऋतौ भवं आर्तवम् । स्त्रीणां यद् अपत्यमार्गात् इषत् कृष्णं विगन्धं च वायु प्रेरितं लोहितं प्रवर्तते, तद् आर्तवं उच्यते । शुक्लं च आर्तवं च शुक्लार्तवं पिण्डे पित्तोः संबन्धि गर्भबीजम् ।

(Śuklaṁ antyē dhātuḥ ṛtau bhavaṁ ārtavam । strīṇāṁ yad apatyamārgāt iṣat kṛṣṇaṁ vigan-
dhaṁ ca vāyu prēritaṁ lōhitaṁ pravartatē,
tad ārtavaṁ ucyatē । śuklaṁ ca ārtavaṁ ca
śuklārtavaṁ piṇḍē pitrōḥ sambandhi garbh-
abījam ।)

Thus explains Aruṇadatta, the commentator. According to ayurveda, śukla and ārtava are the antyadhātu of man and woman respectively. The well-digested annarasa that has gone through its natural metabolic processes referred to as saptadhātu pākaprakriya results in the formation of antyadhātu; the śukla and ārtava. It is a process that has a specific time-period - a month.

In Suśrutasaṁhitā, it is explained like this:

एवं मासेन रसः शुक्लं भवति स्त्रीणां च आर्तवम् ।
(Ēvaṁ māsēna rasaḥ śuklaṁ bhavati strīṇāṁ
ca ārtavam ।)

In a matured man, the antyadhātu (śukla) is always functional and capable of causing pregnancy in a woman. However, the status of antyadhātu of woman is not so. Her antyadhātu is functional and capable of causing pregnancy only when she is ṛtumati. This is why her antyadhātu is called ārtava or that which forms only during the period of ṛtu. According to ācārya Caraka, the description of the word ṛtumati is as follows: “ṛtumati is a woman in whom the garbhāśaya is refreshed after expelling the accumulated old rajas is forming new ārtavam (which also can mean bījam or seed). Such woman with un-vitiated vagina and uterus is the ṛtumati” (Carakasamhita, Śārīrasthāna, 4th chapter). Here garbhāśaya is used to mean all organs associated with reproduction. But, often garbhāśaya is also used to mean uterus. Thus the word ārtava, depending on the context, can have different meanings. General understanding of the word ṛtumati is that she is a woman who is menstruating. But obviously, when ācārya Caraka used the word ṛtumati, that is not what he meant! (Carakasamhita, Śārīrasthānam, 4th chapter).

Ācārya Caraka’s description of the period during which a woman is ṛtumati is also particularly noteworthy. It is in good agreement with the modern biology. The oocyte (egg) maturation and ovulation, whether or not subsequent egg-sperm union occurred, is a part of normal reproductive processes in every mature woman. The ultimate aim of this basic biological process is the zygote formation and subsequent production of the next progeny. Uterus prepares itself each time for the possibility of the establishment of pregnancy.

The membrane of uterus becomes thickened and blood supply to uterus increases during this period. If egg-sperm union and subsequent establishment of pregnancy did not occur, the uterus refreshes itself by expelling the wasted material. This expulsion of the wasted material is referred as rajasravaṁ (menstruation). Rajasravaṁ begins within 14 to 15 days after ovulation. It will take the next 14 to 15 days for completing the next cycle of oocyte maturation and ovulation. The woman who is going through the period between the end of rajasravaṁ and the next ovulation is called ṛtumati. Although there is a general suggestion as after the 3 day-period of menstruation (referred also as raja:sṛuti) from the fourth day onwards the couple may mate, ācārya Caraka specifies that to obtain a child of the desired qualities, the couple shall wait for another 7 more days to mate (Carakasamhita, Śarīrasthāna, 8th chapter). The following 8 days are considered as the most auspicious period to obtain a desired child. Thus, a total of 18 days is considered as ṛtukāla, and of that, the last 8 days are considered as the most effective period for the establishment of a pregnancy that would result in a child of desired quality. Kaśyapasamhita also maintains the same idea. However, in Aṣṭāṅgahṛdaya only 12 days are considered as ṛtukāla which includes the 3 days of menstruation.

ऋतुस्तु द्वादश निशाः पूर्वाः तिस्रोऽत्र निन्दिताः ।
(Ṛtustu dvādaśa niśā:
pūrvā: tistrōṢātra ninditā: ।)

Therefore, the best period for the establishment of pregnancy is not included in this description of ṛtukāla. Although why this discrepancy is unclear, it is evident that the older collections

of ayurvedic principles such as Carakasamhita and Kaśyapasamhita in fact provide, a more accurate picture of ṛtukāla which is in good agreement with modern biology.

The words ārtavam, śōṇitam, rajas and raktam are used as synonyms in ayurveda. However, ācārya Suśruta clarifies the basic differences between these terms.

रञ्जितास्तेजसा त्वापः शरीरस्थेन देहिनाम् ।
अव्यापन्नाः प्रसन्नेन रक्तमित्यभिधीयते ॥ (सु. सू. १४)

(Rañjitāstējasā tvāpa:
śarīrasthēna dēhinām ।
avyāpannā: prasannēna
raktamityabhidhīyatē ॥ (su. sū. 14))

The raktam here is the raktadhātu, the second in the process that makes saptadhātu and is saumya and āgnēya and aśīta and anuṣṇa. On the other hand rajas is described as:

रसादेव स्त्रिया रक्तं रजःसंज्जं प्रवर्तते ।

(Rasādēva striyā raktam raja:samjñam
pravartatē)

Rajas also is formed from rasadhātu. But unlike rakta it is not one of the saptadhātu; it is an upadhātu. Upadhātu is that cannot perform the functions of dhātu, such as nurture a paradhātu, and convert itself into something new by self-digestion. Ācārya Bhōja describes them as gati vivarjitam.

Suśruta emphasizes on the āgnēya quality of ārtavam and śōṇitam by the comment:

आर्तवं शोणितं त्वाग्नेयम् ।
(Ārtavam śōṇitam tvāgnēyam)

This is not an upadhātu. As mentioned earlier, both śukḷa and ārtava are antyadhātu. The śōṇitam in the ārtava śōṇitam is not just

raktam. In Aṣṭāṅgasaṅgraham, there is a reference that suggests, śōṇitam and śuklam are the seeds of man and woman:

अस्याः शोणिताख्ये बीजे, पुंसः शुक्लाख्ये बीजे ।

(Asyā: śōṇitākhyē bijē,
puṁsa: śuklākhyē bijē ।)

Therefore, in this context, though śōṇitam is used to refer to the red color and śuklam is used to refer to the white color, these words are actually referring to the seeds of woman and man in the same way as ārtavam and śuklam. Such use of a word to have a specific meaning when used in a specific context is śvasamjña according to Tantrayukti. Another example of this yukti is seen in reference to the word hṛdaya in ayurveda. In this case, the words mahat and arthaṁ are told as synonyms of hṛdaya, although these words can have other meanings.

Ācārya Suśruta also speaks about aṇḍakōśa or ovary. In the 5th chapter of śārīrasthāna, he talks about the presence of 500 muscles (pēśi) in our body and their specific locations. In addition, he also talks about 20 pēśi that are related to breast and uterus, specifically for women; It is after that the ślōka:

पुंसां पेश्यः पुरस्तात् यः प्रोक्ता लक्षण मुष्कजाः ।
स्त्रीणामावृत्य तिष्ठन्ति फलमन्तर्गतं हि ताः ॥

(Puṁsām pēśya: purastāt ya:
prōktā lakṣaṇa muṣkajā: ।
strīṇāmāvṛtya tiṣṭhanti
phalamantargataṁ hi tā: ॥)

comes, which refers to additional 3 pēśi in women. He has written this ślōka to oppose ācārya Bhōja's version that since women do not have vṛṣaṇa and liṅga (male sex organs)

they lack three pēśi that are required for sexual activity. Actually, the word phala (fruit) also means vṛṣaṇa. This analogy is to refer to the fact that, like the bīja (seeds) that are inside the fruit, the aṇḍa is inside the aṇḍakōśa. This the first reference to the existence of ovary, in a basic ayurvedic text. The use of the word, antargata alludes to the fact that the equivalent sexual organ of vṛṣaṇa is inside the woman. Therefore, it seems like that the ācārya of the older times did know about the presence of internal sex organs of women, however they did not openly explain them; instead they used cryptic meaning to refer to this topic using Tantrayukti. The social circumstances of male dominance in the society in which they lived would have played a crucial role in not making open statements referring to the significance of woman's role in reproduction. Nevertheless, they used cryptic meaning to convey their message to those who are serious about understanding the science. We see reflections of these decadences in woman's social status in the form of unscientific statements regarding the anatomy and physiology of her sexual organs and their functions in many ayurvedic books. Given the fact that ācārya such as Caraka, Suśruta, Kaśyapa have attempted to give us the correct information about this topic, even if they had to use cryptic meaning, it is noteworthy. Unfortunately, the later books seem to carry more unscientific statements, in spite of the clarity of observations provided by the ācāryas such as Caraka. As a result, such unscientific statements regarding ayurvedic principles continue to propagate even in current ayurvedic books that acquire international popularity (for example *Legacy of Caraka*). Therefore it is our duty to ensure that the

upcoming generations become aware of these situations and re-evaluate the explanations of ayurvedic principles related to these topics.

Going back to the śloka - the comparison here of śuklārtava with araṇi and of satva with agni deserves attention. The moment the fire comes in contact with the fuel, it begins to burn. To preserve this burning fire, continuous supply of more and more fuel is essential. Similarly, as soon as satva unites with the śuklārtava the throbbing of life begins, and continuous supply of nourishment is required to maintain this life. The mode of nourishment is being explained as:

बीजात्मकैर्महाभूतैः सूक्ष्मैः सत्वानुगैश्च सः ।
मातुश्चाहारसजैः क्रमात्कुक्षौ विवर्द्धते ॥ २ ॥

(Bījātmakairmahābhūtai:

sūkṣmai: satvānugaiśca sa: ।
mātuścāhārasajai:
kramātkukṣau vivarddhatē ॥ 2 ॥)

The garbhābīja (zygote) grows gradually in the womb getting nourishment from the subtle mahābhūta which are its own components, and which have joined it associated with the satva and which are derived from the essence of mother's food.

तेजो यथाऽर्करश्मीनां स्फटिकेन तिरस्कृतम् ।
नेन्धनं दृश्यते गच्छत्सत्वो गर्भाशयं तथा ॥ ३ ॥

(Tējō yathāSrkarasminām

sphaṭikēna tiraskṛtam ।
nēndhanam dṛṣyatē gacchatsatvō
garbhāśayaṁ tathā ॥ 3 ॥)

The fire latent in the sun rays, concentrated by a convex lens approaching the fuel, (cotton, piece of paper, etc.,), is not visible, but when it burns the fuel, we realize it. In the same

way, the entry of satva into the uterus is not visible, but it can be inferred by the changes occurring there.

कारणानुविधायित्वात्कार्याणां तत्स्वभावता ।
नानायोन्याकृतीः सत्वो धत्तेऽतो द्रुतलोहवत् ॥ ४ ॥

(Kāraṇānuvidhāyitvāt-

kāryāṇām tatsvabhāvatā ।
nānāyōnyākṛtī: satvō
dhattēStō drutalōhavat ॥ 4 ॥)

Effects are produced naturally according to the cause. So the satva assumes different yōni (species) according to the womb of which organism it entered and ākṛti (shape), just like the melted metal assumes different shapes and sizes according to the mould into which it is poured.

अत एव च शुक्लस्य बाहुल्याज्जायते पुमान् ।
रक्तस्य स्त्री, तयोः साम्ये क्लीबः

(Ata ēva ca śuklasya

bāhulyājāyatē pumān ।
raktasya strī, tayō:
sāmyē kṛība:

In the same way, if the śuklā is dominant, a male embryo is formed and if ārtava is dominant, a female, and if both are similar in dominance, a hermatophrodite. Here the word bāhulya means abundance or copiousness. In today's science, although a role for the abundance of śuklā in sex determination is questionable, it is expected to play a role in ensuring the availability of sufficient amounts of functional sperms and thus contributing to the successful establishment of pregnancy. As we-know the sex determination primarily depends on the nature of the sex chromosome (X or Y) present in the sperm that successfully

joins with the ovum. New roles for other factors such as follicular factor-mediated chemotaxis to attract sperm to the ovum are currently emerging. However, what other factors contribute to the joining of a sperm containing Y chromosome with the ovum (that results in male child) over joining of a sperm containing X chromosome with the ovum (that results in female child) or vice versa is currently unclear.

..... शुक्लार्तवे पुनः ॥ ५ ॥
वायुना बहुशो भिन्ने यथास्वं बह्वपत्यता ।

(..... śuklārtavē puna: ॥ 5 ॥
Vāyunā bahuśo bhinnē
yathāsvaṁ bahvapatyatā ।)

The united śukla and ārtava (garbhabija) being divided into many parts by vāyu will become a cause for the formation of many embryos.

वियोनिकृताकारा जायन्ते विकृतैर्मलैः ॥ ६ ॥
(viyōnivikṛtākāra jāyante vikṛtairmalai: ॥ 6 ॥)

During the time of copulation or pregnancy, if the dōṣas are aggravated, and circulating through unusual channels, it will lead to the formation of unnatural embryos.

मासि मासि रजः स्त्रीणां रसजं स्रवति त्र्यह्यम् ।
वत्सराद्द्वादशादूर्ध्वं याति पञ्चशतः क्षयम् ॥ ७ ॥

(Māsi māsi raja: strīṇāṁ
rasajaṁ sravati tryahyam ।
vatsarāddvādaśādūrdhvaṁ
yāti pañcaśata: kṣayam ॥ 7 ॥)

In women, every month, the rajas, (menstrual blood, which is the product of annarasa) flows out for three days. Generally it commences from about the age of twelve and stops after about fifty years.

पूर्णषोडशवर्षा स्त्री पूर्णविंशेन सङ्गता ।
शुद्धे गर्भाशये मार्गे रक्ते शुक्लेऽनिले हृदि ॥ ८ ॥
वीर्यवन्तं सुतं सूते

(Pūrṇaṣoḍaśavarṣā strī
pūrṇavimśēna saṅgatā ।
śuddhē garbhāśayē mārgē
raktē śuklēsnilē hr̥di ॥ 8 ॥
vīryavantaṁ sutam sūte

When a woman becomes 16 years old, she is matured enough to become a mother. At this age, she can give birth to a brave and brilliant child by mating with a man of twenty years, if uterus, channels, ārtava, śukla, vāyu and hr̥daya are pure.

.....ततो न्यूनाब्दयोः पुनः ।
रोग्यल्पायुरधन्यो वा गर्भो भवति नैव वा ॥ ९ ॥

(.....tatō nyūnābdayō: puna: ।
rōgyalpāyuradhanyō vā
garbhō bhavati naiva vā ॥ 9 ॥)

If both of them have not completed the above mentioned age, the progeny will be either sick or short lived or inauspicious or even pregnancy may not occur.

वातादिकुणपग्रन्थि पूयक्षीणमलाह्वयम् ।
बीजासमर्थे रेतोसं स्वलिङ्गैर्दोषजं वदेत् ॥ १० ॥
रक्तेन कुणपं, श्लेष्मवाताभ्यां ग्रन्थिसन्निभम् ।
पूयाभं रक्तपित्ताभ्यां, क्षीणं मारुतपित्ततः ॥ ११ ॥
कृच्छ्राण्येतान्यसाध्यं तु त्रिदोषं मूत्रविट्प्रभम् ।

(Vātādikuṇapagrān̥thi
pūyakṣīṇamalāhvayam ।
bijāsamarthē rētōsraṁ
svaliṅgairdōṣajaṁ vadēt ॥ 10 ॥
Raktēna kuṇapaṁ, ślēṣma-
vātābhyāṁ grān̥thisannibham ।

pūyābham raktapittābhyām,
 kṣīṇam mārutapittata: ॥ 11 ॥
 Kṛcchrānyētānyasādhyām
 tu tridōṣam mūtraviṭprbham ।)

Śukla and ārtava if vitiated by dōṣas are not able to produce garbhajīva (zygote). Śukla is named as per the mode of vitiation as vātaśukla, pittaśukla and kaphaśukla, vitiated by all three dōṣas, kuṇapaśukla” (having the smell of dead body), granthiśukla (coagulated), pūyaśukla (resembling pus), kṣīṇaśukla (decrease in quantity), and malaśukla (having the smell of urine or faeces). In the same way, vitiated ārtava is known by the same qualifying names as vātārtava, etc. In vitiation, the specific symptoms of each dōṣa are manifested. Kuṇapa is by vitiation of rakta, granthi is of kapha and vāta, pūya is of rakta and pitta, kṣīṇa is of vāta and pitta, and mala by the vitiation of all three dōṣas. Among these, the last mentioned one is incurable. All the others are very difficult to cure (kṛcchra-sādhyā).

कुर्याद्वातादिभिर्दुष्टे स्वौषधं कुणपे पुनः ॥ १२ ॥
 धातकीपुष्पखदिरदाडिमार्जुनसाधितम् ।
 पाययेत्सर्पिरथवा विपक्रमसनादिभिः ॥ १३ ॥

(kuryādvātādibhirduṣṭē
 svauśadham kuṇapē puna: ॥ 12 ॥

Dhātakīpuṣpakhadira-
 dāḍimārjunasādhitam ।

pāyayētsarpirathavā
 vipakvamasanādibhi: ॥ 13 ॥)

In the vitiation of śukla and ārtava, by vāta, pitta and kapha, medicines and methods to pacify these dōṣas are to be adopted. For example, to pacify vāta unctuous, hot, sweet, sour and salty substances and vasti are used. Similarly, sweet, cold and astringent substances

and purgation can be used to pacify pitta and pungent, bitter, astringent and dry things and emesis can be used to pacify kapha. In kuṇapa śukla, ghee medicated with dhātakīpuṣpa (*Woodfordia fruticosa*), khadira (*Acacia catechu*), dāḍimā (*Punica granatum*), and arjuna (*Terminalia arjuna*), is to be taken internally, or ghee mediated with Asanādigaṇa can be taken.

पलाशभस्माश्मभिदा ग्रन्थ्याभे पूयरेतसि ।
 परूषकवटादिभ्यां क्षीणे शुक्लकरी क्रिया ॥ १४ ॥

(Palāśabhasmāśmabhidā
 granthyābhē pūyarētasi ।
 parūṣakavaṭādibhyām
 kṣīṇē śuklakarī kriyā ॥ 14 ॥)

In granthiśukla ghee medicated with Palāśabhasma (the ash of *Palāśa-Butea monosperma*) and āsmabhit (*Rotula aquatica*) should be used. In pūyaśukla ghee medicated with the drug combination of Parūṣakādigaṇa and Nyagrōdhādigaṇa and in kṣīṇaśukla all steps which produce and increase semen are to be used.

संशुद्धो विट्प्रभे सर्पिर्हिङ्गुसेव्यादि(ग्नि)साधितम् ।
 पिबेत्

(Samśuddhō viṭprbhē
 sarpirhiṅgusevyādi(gni)sādhitam ।
 pibēt

In malaśukla, after subjecting the patient to purificatory treatment, ghee prepared with hiṅgu (*Ferula asafoetida*), sēvya (*Vetiveria zizanioides*) and agni (*plumbago indica*) is to be administered. However, since malaśukla is resulting from the vitiation of three dōṣas, it is incurable. Nevertheless, the above said

treatment may give some relief.

.....ग्रन्थ्यार्तवे पाठाव्योषवृक्षकजं जलम् ॥ १५ ॥

पेयं कुणपपूयासे चन्दनं वक्ष्यते तु यत् ।

गुह्यरोगे च तत्सर्वे कार्ये सोत्तरवस्तिकम् ॥ १६ ॥

(.....granthyārtavē pāṭhā-

vyōṣavṛkṣakajaṁ jalam ॥ 15 ॥

Pēyaṁ kuṇapapūyāsre

candanaṁ vakṣyātē tu yat ।

guhyarōgē ca tatsarvē

kāryē sōttaravastikam ॥ 16 ॥)

In granthyārthva, a decoction of pāṭha (*Cyclea peltata*), vyōṣa (*Zingiber officinale*, *Piper nigrum*, *Piper longum*) and vṛṣaka (*Holarrhena pubescens*) is prescribed. In kuṇapārtava and pūyārtava, the decoction of candana (*Santalum album*) should be taken. All treatments prescribed in Guhyarōgapratiṣēdha (including uttaravasti) are to be employed here.

शुक्लं शुक्लं गुरु स्निग्धं मधुरं बहलं बहु ।

घृतमाक्षिकतैलाभं सद्भाय.....

(Śuklaṁ śuklaṁ guru snigdham

madhuraṁ bahalaṁ bahu ।

ghṛtamākṣikatailābham

sadgarbhāya.....)

Śukla having the qualities such as white in colour, heavy, unctuous, dense, copious and resembling either ghee, honey or sesame oil is capable of producing a healthy embryo.

The commentator Aruṇadatta gives the meaning of the word घृतमाक्षिकतैलाभं as this: If semen is resembling ghee in colour, the progeny will be fair in complexion, if semen resembles honey, the progeny will be brown, and if semen

is like sesame oil, the progeny is destined to have dark complexion.

.....आर्तवं पुनः ॥ १७ ॥

लाक्षारसशशाभं धौतं यच्च विरज्यते ।

(.....ārtavaṁ puna: ॥ 17 ॥

Lākṣārasasaśāsrābham

dhautam yacca virajyatē ।)

The menstrual blood, if it is just like lac juice or like the blood of the rabbit, and if the blood-stained cloth is clean after washing, then it is pure and can create a healthy embryo.

शुद्धशुक्लार्तवं स्वस्थं संरक्तं मिथुनं मिथः ॥ १८ ॥

स्नेहैः पुंसवनैः स्निग्धं शुद्धं शीलितवस्तिकम् ।

नरं विशेषात्क्षीराज्यैर्मधुरौषधसंस्कृतैः ॥ १९ ॥

नारी तैलेन माषैश्च पित्तलैः समुपाचरेत् ।

(śudhasuklārtavaṁ svastham

saṁraktaṁ mithunaṁ mitha: ॥ 18 ॥

Snēhai: puṁsavanai: snigdham

śuddham śīlitavastikam ।

naraṁ viśeṣātkṣīrājyair-

madhuraūṣadhasaṁskṛtai: ॥ 19 ॥

Nāri tailēna māṣaiśca

pittaḷai: samupācarēt ।)

The healthy couple with pure bījas and loving each other deeply, to beget an auspicious offspring, should undergo a course of treatment in which oleation with Puṁsavanaghṛta and purification steps (especially vasti) are included. Puṁsavana is a ritual or medicine that helps to beget a healthy child of desired quality. Ghees such as Mahākalyāṇakaghṛta and Phalasarpi are examples of this. After this treatments, the man's diet should be mainly consisting of milk and ghee prepared with sweet

mediations and the woman's diet should be consisting of sesame oil and black gram.

क्षामप्रसन्नवदनां स्फुरच्छ्रोणिपयोधराम् ॥ २० ॥
स्रस्ताक्षिकृक्षि पुंस्कामां विद्यात् ऋतुमतीं स्त्रियम् ।

(kṣāmaprasannavadanām
sphuracchrōṇipayōdharām ॥ 20 ॥
Srastākṣikukṣim puṃskāmām
vidyāt ṛtumatīm striyam ।)

A woman with slightly emaciated and pleasant face, her pelvis and breasts throbbing, eyes and abdomen drooping down, and herself longing for man's company, should be understood as ṛtumati.

पद्मं सङ्कोचमायाति दिनेऽतीते यथा, तथा ॥ २१ ॥
ऋतावतीते योनिः, सा शुक्लं नातः प्रतीच्छति ।

(padmaṃ saṅkōcamāyāti
dinēṢtītē yathā, tathā ॥ 21 ॥
Rtāvatītē yōni:, sā
śuklaṃ nāta: pratīcchati ।)

As the lotus closes at the end of the day, the yōni (uterus) also shrinks after the ṛtukāla, so it will not be ready to receive śukla.

मासेनोपचितं रक्तं धमनीभ्यामृतौ पुनः ॥ २२ ॥
ईषत्कृष्णं विगन्धं च वायुर्योनिमुखान्नुदेत् ।

(māsēnōpacitam raktam
dhamanibhyāmṛtau puna: ॥ 2 ॥
Īṣatkṛṣṇam vigandham ca
vāyuryōnimukhānnudēt ।)

The blood accumulated in the uterus through dhamani (channels) within the course of one month, slightly black and without smell is expelled by vāyu through vaginal tract in ṛtukāla.

ततः पुष्पेक्षणादेव कल्याणध्यायिनी त्र्यहम् ॥ २३ ॥
मृजालङ्काररहिता दर्भसंस्तरशायिनी ।
क्षैरेयं यावकं स्तोत्रं कोष्ठशोधनकर्षणम् ॥ २४ ॥
पर्णे शरावे हस्ते वा भुञ्जित ब्रह्मचारिणी ।

(tata: puṣpēkṣaṇādēva
kalyāṇadhyāyinī tryaham ॥ 23 ॥
Mrjālaṅkārahitā
darbhasamstaraśāyinī ।
kṣairēyam yāvakaṃ stōtram
kōṣṭhaśōdhanakarṣaṇam ॥ 24 ॥
Parnē śarāvē hastē vā
bhuñjita brahmacāriṇī ।)

Then (after completing the treatment), when the menstrual flow appears the woman should retreat from all her usual works and rest calmly for three days. She should meditate and focus only on auspicious things. She should not take bath or use body decorations. She should sleep on a mat made of darbha grass (*Desmostachya bipinnata*). Her diet should be of a very small quantity consisting of yava prepared with milk served on either a leaf or earthen pot or her palm. This would purify her abdomen and reduce its size. In these days she should observe celibacy.

चतुर्थेऽह्नि ततः स्नाता शुक्लमाल्याम्बरा शुचिः ॥ २४ ॥
इच्छन्ती भर्तृसदृशं पुत्रं पश्येत्पुरः पतिम् ।

(caturthēṢhni tata: snātā
śuklamālyāambarā śuci: ॥ 24 ॥
Icchantī bhartṛsadrṣam
putram paśyētpura: patim ।)

On fourth day, she should take bath, wear white dress and garlands, and remain clean in body and mind. Then she should see her husband first desiring for a son resembling him.

ऋतस्तु द्वादशानिशाः पूर्वास्तिस्रोऽत्र निन्दिताः ॥ २६ ॥
एकादशी च, युग्मासु स्यात्पुत्रोऽन्यासु कन्यका ।

(ṛtastu dvādaśānīśā:

pūrvāstisrōstra ninditā: ॥ 26 ॥

Ēkādaśī ca, yugmāsu

syātputrōsnyāsu kanyakā ।)

The ṛtukāla is for twelve nights - of these, the first three days and the eleventh one are not auspicious. Mating on even-numbered days leads to the birth of a son and on odd-numbered days leads to the birth of a daughter. (This statement of the period of ṛtukāla is not consistent with that of ācārya Caraka and this discrepancy is pointed out earlier in this discussion).

उपाध्यायोऽथ पुत्रीयं कुर्वीत विधिवद्विधिम् ॥ २७ ॥

नमस्कारपरायास्तु शूद्राया मन्त्रवर्जितम् ।

अवन्ध्य एवं संयोगः स्यादपत्यं च कामतः ॥ २८ ॥

(upādhyāyōsṭha putrīyaṁ

kurvīta vidhivadvidhim ॥ 27 ॥

Namaskāraparāyāstu

śūdrāyā mantravarjitaṁ ।

avandhya ēvaṁ saṁyōga:

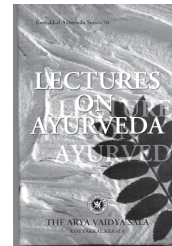
syādapatyaṁ ca kāmata: ॥ 28 ॥)

Then all the holy rituals for begetting a child should be performed by the priest according to the order prescribed in Atharvavēda. If the woman is of low cast (śūdra), these rituals should be performed without mantras, and with giving prominence to namaskāra. Performing these procedures will ensure that the mating will not be futile and will result in begetting a child of desired qualities.

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COMPARATIVE ANATOMICAL AND PHYTOCHEMICAL MARKERS TO IDENTIFY AŚŌKA FROM ITS COMMON ADULTERANT

A.B. Rema Shree, S. Sudhakar Raja, A. Jayanthi, K.P Unnikrishnan
and Indira Balachandran*

Abstract: Comparative anatomy is a reliable tool to identify genuine raw drug from their substitutes and adulterants. This study describes the anatomical and phytochemical characterization of the reputed ayurvedic raw drug aśōka, dried bark of *Saraca asoca* - a red listed plant, and its common adulterant *Polyalthia longifolia*. The anatomical markers evolved from the study help to identify the genuine raw drug correctly and to distinguish the same from spurious ones. TLC and HPLC profiles of these two plants reveal the correct identity of the genuine plant. This method can be used for the floor level checking of raw drugs used in ayurveda, which will in turn lead to the standardization and quality control.

Introduction

The raw drug aśōka is the bark of a red listed medicinal tree *Saraca asoca* (Roxb.) De Wilde belonging to the family Caesalpiniaceae. In India its distribution is confined to the moist zones of Western and Eastern Ghats, Sub Himalayan tracts and Eastern India. The bark of the tree is a well-reputed remedy in ayurveda for all uterine problems and is widely used in several ayurvedic preparations. (Warrier et al., 1996, 2001 and Sivarajan et al., 1994). The bark is dark brown and contains tannins, catechol, haematoxylin, ketosterol, crystalline glycoside, saponins and organic compound of calcium and iron (anonymous 2003).

The indiscriminate use and unscientific

extraction of the bark of aśōka has lead to acute scarcity of this genuine raw drug, and this in turn, has lead to cost escalation and wide spread adulteration/substitution of the drug. Taxonomic identification becomes difficult in the case of crude drugs where only plant parts like root, bark, stem, etc. are being used. Normally the adulteration/substitution of the drug is being done with materials which look very similar to the genuine raw drug and that are available in plenty. In the case of aśōka, the bark is commonly adulterated with the bark of an ornamental tree *Polyalthia* having similar external appearance (Iyer and Kolammal, 1960). Such adulteration leads to a wide variation in quality and medicinal efficacy of

*Centre For Medicinal Plants Research (CMPR), Arya Vaidya Sala, Kottakkal- 676 503, Malappuram

the drug. Srivastava *et al.* (1995) has reported that anatomical and phytochemical studies are very essential in the identification and quality control of the raw drug. Dickison (2000) reports that the pharmacognostic study of herbs, spices and drug plants involves the microscopic evaluation of plant tissue in sectional and powder-form and the histological characters of these plants can be used for the identification of tissue samples; hence, there is a much-felt need for evolving identification keys and standards of genuine medicinal plants for detecting the adulterants. This study highlights a set of anatomical and phytochemical characters, which are identified as markers, for the quick identification of the bark of *Saraca asoca* from its adulterant *P. longifolia*. The method is useful for the floor level checking of the raw drugs for its purity.

Materials and methods

The bark of *Saraca asoca* and *Polyalthia longifolia* were collected from the Herb Garden, Arya Vaidya Sala, Kottakkal, Kerala; and the raw drug samples from various raw drug markets. The collected materials processed as per the standard procedures for histological studies (Johansen 1940; Berlin and Mikshe 1976) and the measurements were taken using ocular and stage micrometers. Photomicrographs were taken using Canon digital camera attached to Zeiss microscope.

Chemical Studies

Extraction

Around 50 g of air-dried barks of *S. asoca* and *P. longifolia* were powdered and 5 g of the powdered material macerated with 100 ml of 0.5% phosphoric acid for 24 hours. The extract was filtered and concentrated under reduced

pressure in a rotary evaporator, passed through 0.45µm PVDF filter and used for the HPLC analysis.

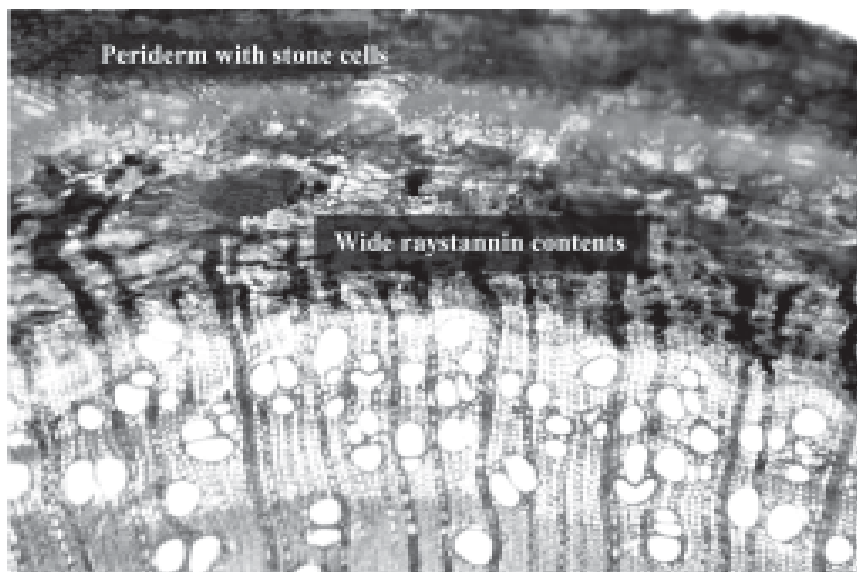
High Pressure Liquid Chromatography

The Shimadzu HPLC system consisting of LC - 10ATVP pump, a rheodyne injector, SPD M10AVP photodiode array detector and CLASS-VP 6.12 SP5 integration software was used for the analysis. The stationary phase was Phenomenex Luna C 18 (250 x 4.6mm) column with 5µ particle size and a guard column. The mobile phase, consisting of acetonitrile: 0.5% phosphoric acid (15:85) was passed through 0.45 µ PVDF filter, degassed and used. The column was equilibrated with the mobile phase for an hour and then pumped at the rate of 1.0 ml/min. with a backpressure of 200 kg/sq.cm. The injector volume was 20 µl and the chromatogram run for 40 min. The injector and the detector were flushed with the mobile phase and the chromatogram scanned at 254 nm.

Results

The matured bark of 5-20 mm thickness is very hard, the outer surface is rough and brown and the inner surface is reddish brown in colour. The outer surface is rough due to the presence of prominent curved, thick and broken lenticels. The fracture is short and slightly fibrous. In *P. longifolia* bark surface is comparatively smooth with small lenticels. Fractures are hard and strongly fibrous.

Aśōka bark consists of 20-25 layers of narrow and tangentially elongated periderm cells. Most of the cells in the periderm region contain tannin. It interrupts at many regions due to the presence of the lenticels. Several prominent groups and one or two layers of stone cells of different shape are seen in the cortex and some

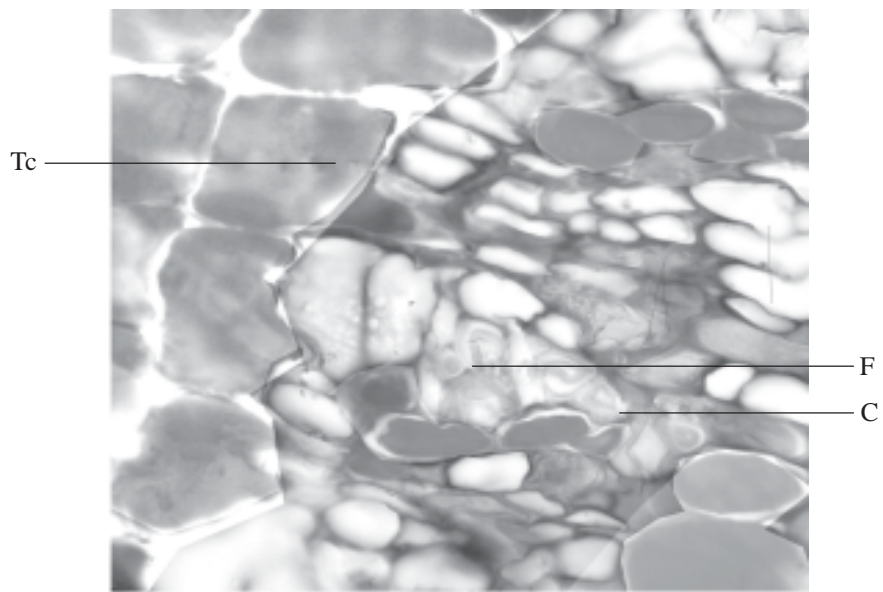


a

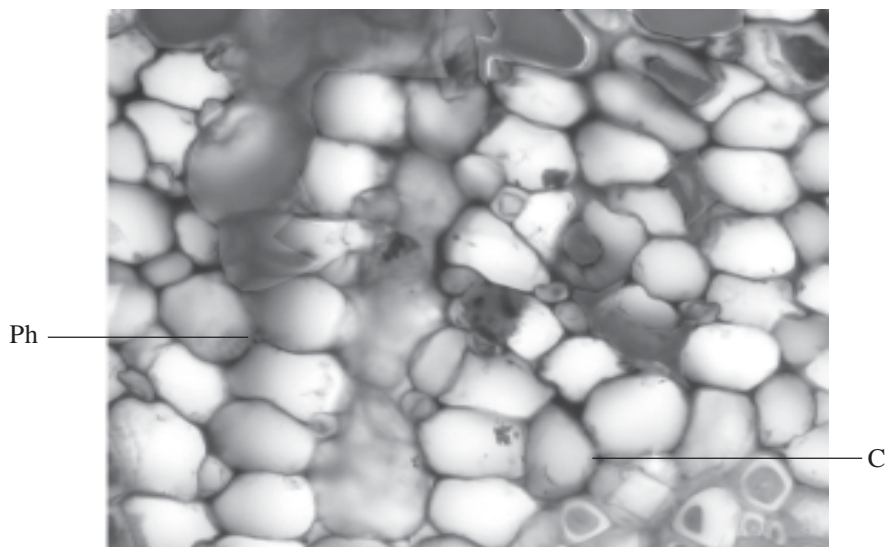


b

Fig. I a-b T.s and L.s of *Saraca asoca* - bark



a



b

Fig. II **a-b** T.s of *Saraca asoca* - bark

Tc Tannin cells **F** Fibres **C** Crystals **Ph** Phloem

of the cells contain crystals. Continuous band of 1-3 layers of stone cells in the outer cortex is the characteristic feature of the bark of aśōka. A few cells in the cortex contain compound starch grains and prismatic crystals of calcium oxalate. The secondary phloem of the bark is a wide zone traversed by phloem rays with tannin content and becoming much wider, dilated and funnel shaped towards the peripheral region. Secondary phloem consists of phloem fibers, phloem parenchyma and sieve tubes and a few thick-walled cells more or less concentric bands in radial rows of phloem elements. Some of the cells in the secondary phloem contain prismatic crystals of calcium oxalate especially in phloem rays. Most of the medullary rays are uniseriate in wood region and biseriate to multiseriate towards secondary phloem and cortical region. Medullary rays contain high deposition of tannin and crystals and it is a characteristic feature of aśōka bark. The powdered bark shows phloem elements with simple perforation plates, phloem fibres, parenchymatous tissue and different shaped stone cells with thick-pitted walls. Some of the stone cell contains prismatic crystals and a few have oil contents. Starch grains are found to be simple, but compound starch grains are also observed. The major distinguishing features of *S. asoca* and its adulterant *P. longifolia* are listed in the Table 1 and comparative anatomical features of the bark and bark powder are shown in the figures 1-6.

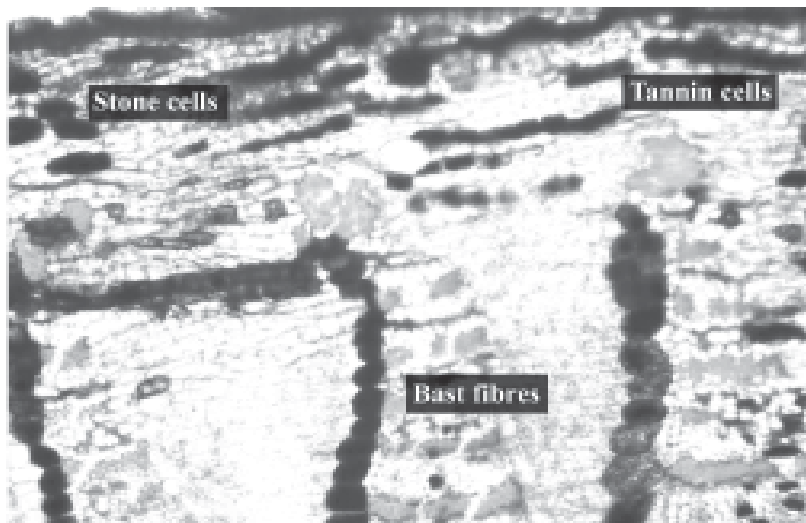
The HPLC profiles of the bark extracts were developed using C-18 column as stationary phase and acetonitrile: 0.5% phosphoric acid (15:85) as mobile phase. The HPLC profile of *S. asoca* bark was found to have 14 major peaks whereas the bark of *Polyalthia longifolia* was

found to contain only 4 major peaks (Table 2, Figs. VIIa-b). The variation in the number of peaks gives an idea about the dissimilarity in the compounds present in the barks. The HPLC fingerprints of the two plants showed a wide variation in the presence of compounds, which can be used for the identification of these plants in commercial samples.

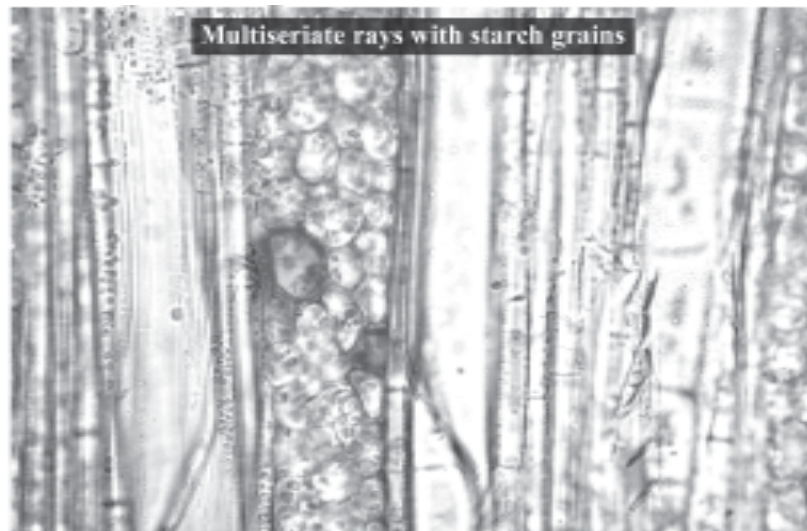
The anatomical and phytochemical characterizations of the crude drugs provide ample evidence for the detection of genuine source plant from their spurious adulterants. It is for the first time that this type of study is being carried out in *Saraca asoca* and *Polyalthia longifolia*. The earlier workers concentrated mainly on the chemistry and pharmacognosy of *S.asoca* (Anonymous 1990, Evans 2002). In the European pharmacopoeia and the British Pharmacopoeia the detailed morphology, anatomy and phytochemistry of many drugs are discussed and such descriptions form the basis for the identification and quality control of the raw drugs (Evans 2002). Presence of higher rate of tannin contents in the cells is positively correlated to the antioxidant nature of the plant. Warriar *et al.* (2001) and Kolammal (1978) reported the histology of bark of *Saraca asoca*. But there is no report on the comparative anatomical, histochemical and chemical studies of the bark of *S.asoca* and its common adulterant *P.longifolia*. The present study describes both the distinguishing anatomical and chemical features of these plants in order to establish standards for the identity and quality control of genuine *S. asoca* bark from its spurious ones.

Conclusion

This method can be applied to draw a group of

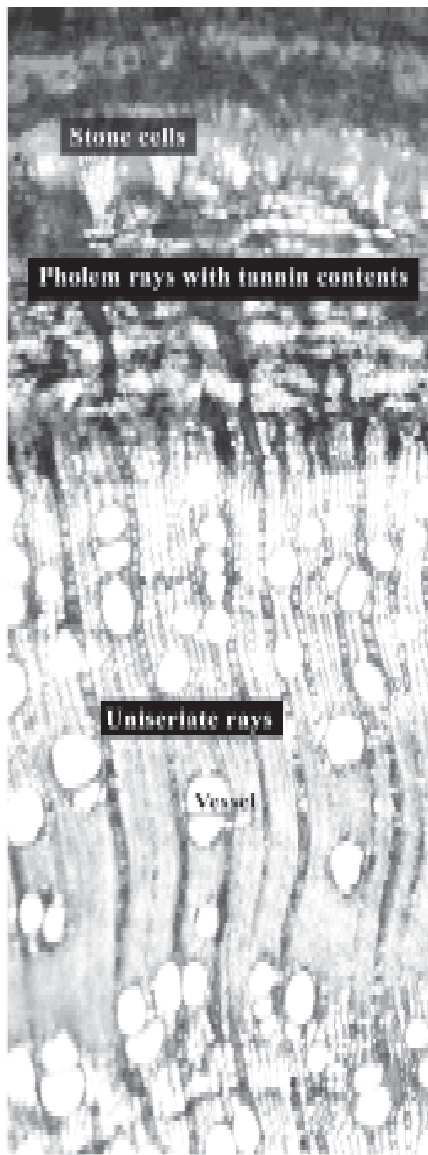


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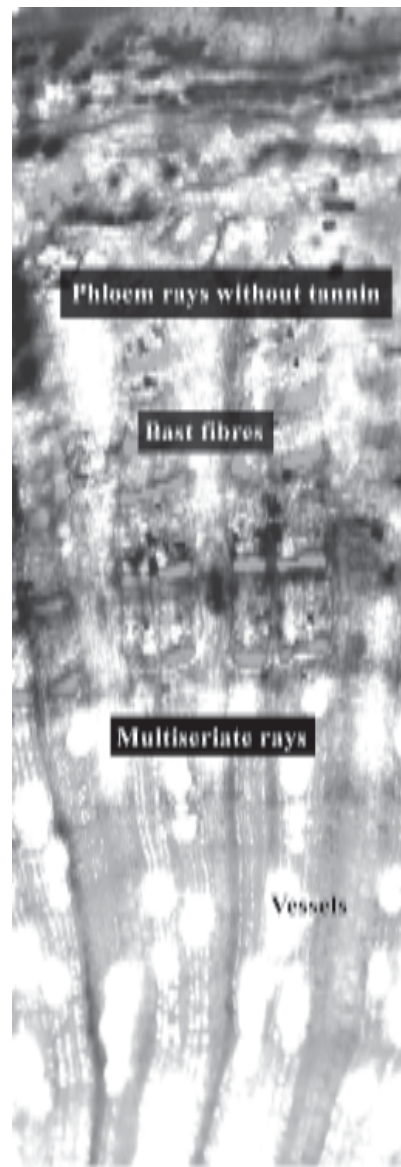


b

Fig. III a-b T.s and L.s of *Polyalthia longifolia* - bark



a



b

Fig. IV **a-b** T.s of stem of *S. asoca* and *P. longifolia* - bark

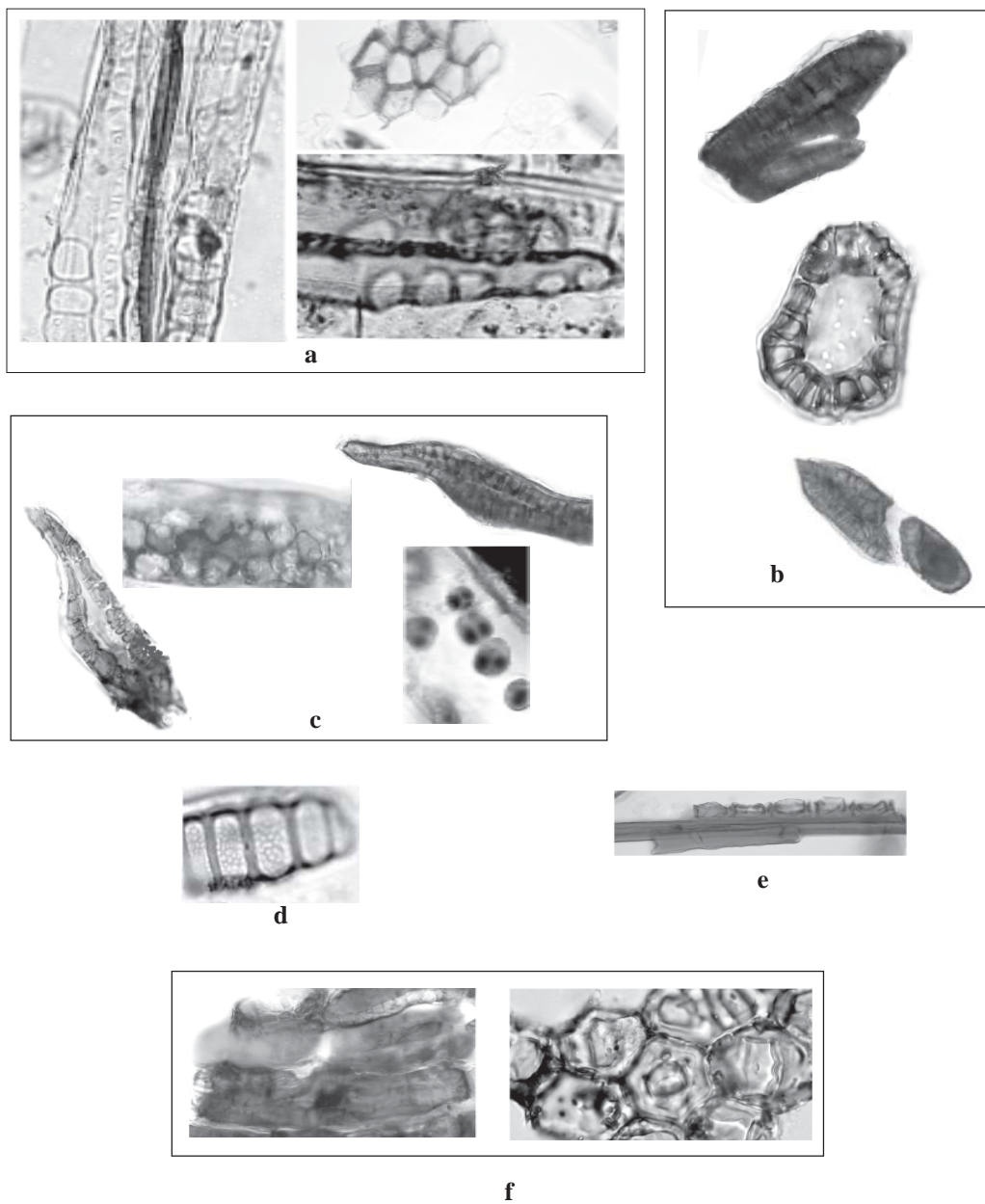
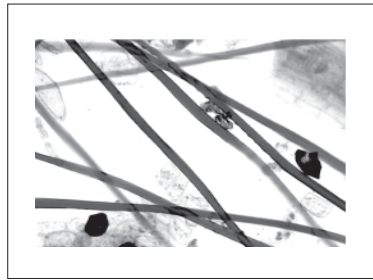
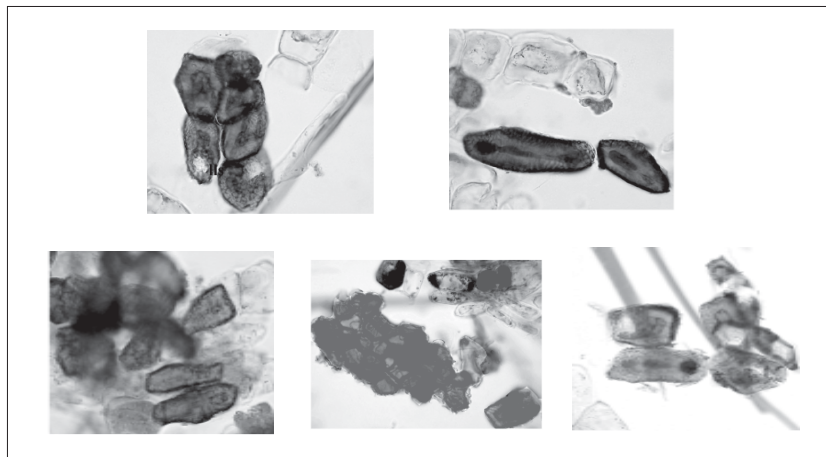


Fig. V **a-f** Powder characters of *S. asoca*

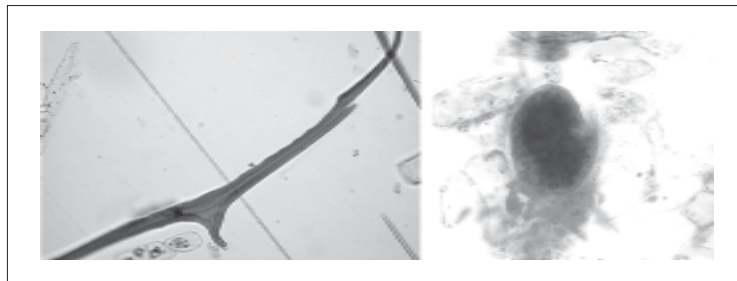
- a** Sieve tube and fibres **b** Different types of stone cells **c** Compound starch grains
d Sieve plates **e** Fibres **f** Crystals



a



b



c

Fig. VI **a-c** Powder characters of *P. longifolia* : **a** Fibres **b** Sclereids **c** Stone cells

TABLE 1
Distinguishing anatomical features of *Saraca asoca* and *Polyalthia longifolia*

Sr. No	<i>Saraca asoca</i>	<i>Polyalthia longifolia</i>
1.	Outer surface of the bark is uneven due to the presence of many rounded or broken lenticels	Surface of the stem bark is comparatively smooth with small lenticels
2.	Fractures are slightly fibrous	Fractures are hard and strongly fibrous
3.	Bands of stone cells are seen in the outer and inner cortex with an average length of 139.6µm and a width of 37.4µm and wall thickness of 13.2µm. (Fig. IVa)	Stone cells are in groups and it is scattered in the cortex. (Fig. IVb)
4.	Tannin cells are present in the ray cells. (Fig. Ib)	Tannin cells form horizontal strips in the outer cortex and scattered in the inner cortex. (Fig. IIIa)
5.	Starch grains are of simple and compound type and rare in ray cells. (Fig. V)	Most of the parenchyma cells and multiseriate ray cells are fully filled with starch grains. (Fig. IIIb)
6.	Cortical cells contain prismatic calcium oxalate crystals of varying sizes and sclereids are also present. (Fig. Ia)	Cortical region contains patches of stone cells with crystals of calcium oxalate. (Fig. IVb)
7.	Phloem tissue contains crystals and a few fibres. (Fig. IIb)	Both in primary and secondary phloem, groups of fibre tissue (bast fibres) are present. (Fig. IIIa & IVb)
8.	Most of the medullary rays are uniseriate. Tannins and calcium oxalate crystals are present in the ray cells. (Fig. Ib & IVa)	Wide multiseriate medullary rays with full of starch grains. (Fig. IIIb)
9.	Medullary ray cells uniseriate in wood region and dialate radially towards peripheral region and become multiseriate with filled with tannin contents. (Fig. IIa & IVa)	Multiseriate medullary ray cells dialate radially towards the periphery and tannin cells are absent. (Fig. IIIa & IVb)
10.	Bark powder contains only a few bast fibres, large stone cells with thick walls and prominent pittings. (Fig. V)	Bark powder contains lot of fibres, sclereids and comparatively smaller stone cells with tannin contents. (Fig. VI)
11.	Crystal fibres present (Fig. V)	Crystal fibres absent

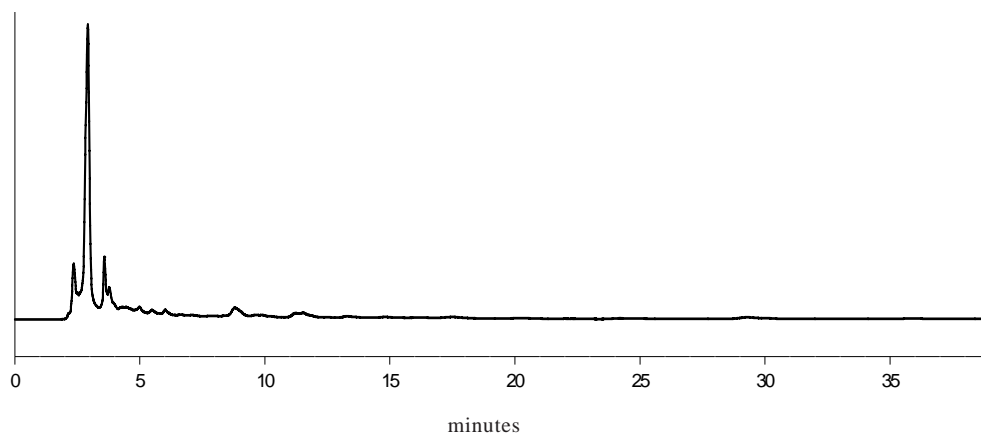


Fig. VIIa.
HPLC of *Saraca asoca* bark extract

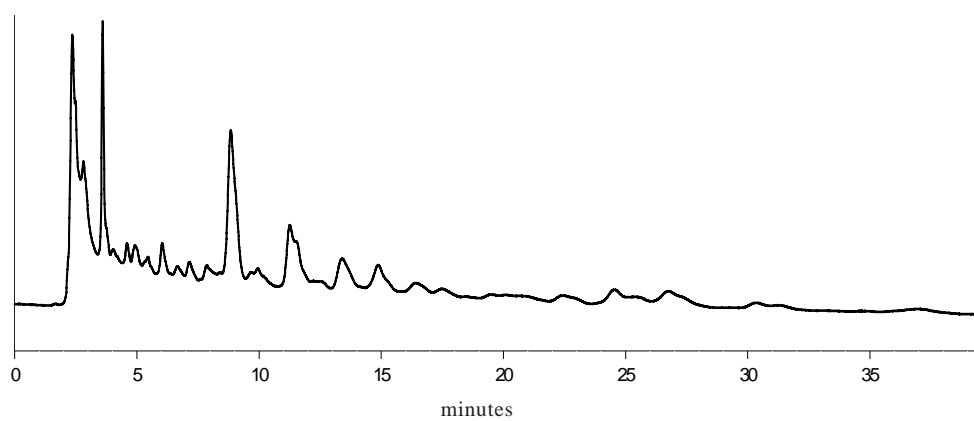


Fig. VIIb.
HPLC of *Polyalthia longifolia* bark extract

TABLE 2
HPLC Fingerprint profiling of *S. asoca* and
P. longifolia - bark

Plant material	Peak No.	Retention Time (Rt) - min.	% AUC
<i>Saraca asoca</i>	1	2.36	20.01
	2	2.82	2.73
	3	3.59	11.21
	4	4.60	1.12
	5	6.04	2.72
	6	8.84	22.30
	7	11.25	3.28
	8	13.40	6.67
	9	14.88	5.36
	10	16.42	2.27
	11	22.43	2.51
	12	24.55	2.12
	13	26.73	4.97
	14	36.96	2.44
<i>Polythia longifolia</i>	1	2.36	7.82
	2	2.92	71.67
	3	3.57	5.60
	4	8.80	4.89

distinguishing anatomical and phytochemical features of the genuine drug and thereby to make out the same from their spurious ones. This is found to be a useful aid to achieve the goal of standardization and quality control of the raw drugs used in Ayurveda and other herbal systems of medicine.

Acknowledgement

The authors are grateful to Sir Dorabji Tata Trust, Mumbai for financial assistance to undertake the research work and to Dr.P.N. Ravindran, Visiting Scientist for providing necessary guidance for the study.

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**ANTIESTROGENIC PROPERTY OF *LINDENBERGIA*
INDICA IN FEMALE ALBINO RATS WITH SPECIAL
REFERENCE TO TISSUE BIOCHEMISTRY**

Ashok Purohit and Surendra K. Vyas*

Abstract: *Lindenbergia indica*, belongs to the Scrophulariaceae family, is a small genus of annual or perennial herb distributed throughout tropical Asia and Africa. This paper evaluates the contraceptive efficacy of the extract of *Lindenbergia indica* in female rats.

Introduction

Today's alarming rates of population growth is one of the most serious problems of confronting proportions. During the past few decades, most developing countries are in the grip of burgeoning populations. So there have always been efforts in developing fertility control methods¹ but some of these contraceptive methods have more disadvantages than advantage. The need to develop a simple, safe, effective, cheap and easily administrable medicinal herb, oral contraceptive is very well recognized.

Lindenbergia indica is an indigenous drug used in chronic bronchitis, externally in skin eruption in combination with the juice of coriander^{4,5}. A number of terpenoids were isolated from this plant and some of which showed cytotoxicity against human cancer cell lines⁶ but no work was done on the reproduction site. So the

present study is aimed to assess the contraceptive efficacy of *Lindenbergia indica* (70% EtoH) extract in female rats with a view to develop a contraceptive oral agent for female human beings.

Material and method

The plant was collected from Udaipur (Rajasthan). Its identification was confirmed at Botany Department of J.N.V. University, Jodhpur. The whole plant was taken, dried under shade, powdered and soxhalation was done with 70% ethanol. The extract was collected after evaporating ethanol under reduced pressure. The dose was determined by LD₅₀³⁰ test, and it came to 500mg/kg body weight; the high dose was 1000 mg/kg body weight.

Fertile, healthy adult female albino rats (*Rattus norvegicus*) weighing (150 to 200g) were maintained at 24° + 5°C and fed with standard

* *Reproduction Physiology Section, Department of Zoology, JNV University, Jodhpur – 342 005, India*

diet and water *ad libitum*. They were divided into 3 groups of 5 each. The animals of the control group received only distilled water. The animals of the experimental group were fed with 500 mg/kg and 1000 mg/kg b. wt. orally/rat/day for 30 days. On 25th day to 30th day the animals were kept for fertility test with males in 1:2 ratio. Everyday the vaginal smear was taken and observed the estrus phases in the female rats. The vaginal plug and the presence of sperms in the vaginal smear was a proof of successful mating. Then the mated females were separated for recovery and observed the implantation sites on 16th day of pregnancy through laprotomy. The fertility test was assessed⁷. After completion of experiment, body weight was recorded and animals were autopsied by using chloroform on the 31st day. The weights of organs were recorded after removing the adherent tissue. The fresh tissues

were frozen for determining the cholesterol⁸, glycogen⁹, fructose¹⁰, protein¹¹, and sialic acid¹². The remaining tissues were fixed in Bouin's fluid passed through alcoholic dehydration and embedded in paraffin wax. The 5m sections made and stained with Harris hematoxylin and eosin and the data were reported as mean + SEM. The significance was observed by applying student's 't' test¹³.

Result

The weight of all the reproductive organs found significantly decreased (P:S 0.01 to 0.001) (Table-1). When compared to control group i.e. Group A, the ovarian cholesterol found significantly decreased in the group B; it was found highly reduced in group C. The uterine cholesterol found significantly decreased in both the groups B&C and both the groups showed non-significant reduction in the glycogen and sialic acid contents of ovary and uterus.

TABLE 1
Body and organ weight of *Lindenbergia indica* female albino rats
(Mean of 5 animals + S.E.)

Treatment group	Body weight (g)		Ovary	Uterus	Vagina
	Initial	Final	Mg/100g body weight		
Intact (control) (Group A)	159.16 + 14.17	164.00 + 17.62	57.00 + 2.34	150.29 + 4.65	120.32 + 4.42
Intact + <i>L. indica</i> - orally for 30 days - low dose (Group B)	147.16 + 11.37	138.33 + 16.17	40.84 ^b + 2.95	77.16 ^c + 4.16	43.66 ^c + 5.13
Intact + <i>L. indica</i> - orally for 30 days - high dose (Group C)	213.00 + 1.22	201.25 + 6.57	36.23 ^c + 1.26	66.78 ^c + 3.92	34.01 ^c + 4.15

a = p<0.05; b = p <0.01; c = p<0.001

Compared to the control group, fructose in uterus showed highly significant reduction ($p < 0.001$) in both the B and C groups; on comparison to group C, group B showed highly significant reduction in protein contents of ovary and uterus (Table-2).

Discussion

The chronic administration of *Lindenbergia indica* at low and high dose induced a significant decrease in the weight of reproductive organs¹⁴, which reflects the estrogen imbalance and inhibition of estrogen production by the ovary¹⁵. Cholesterol is an important precursor in the synthesis of steroid hormones¹⁶. Decreased levels of cholesterol in the ovary and uterus might be due to its use in the already augmented steroidogenesis in the existing follicles and that shows the antiestrogenic nature

of the plant product, which leads into estrogen depletion causing impairment of oogenesis¹⁷. Glycogen is an energy source for female reproductive activities. Decreased level of glycogen content in the ovary reported in both groups B&C remain statistically non significant, which is probably associated with the eobolic properties of extract and due to low availability of pituitary gonadotrophins¹⁸.

Further, the estrogen dependent parameter like fructose, sialic acid and protein levels were reduced in reproductive organs¹⁹⁻²², but the maximum decline was observed at high dose of plant product. These findings further support the estrogen imbalance. In conclusion, the effect of *Lindenbergia indica* (70%EtOH) extract showed antiestrogenic property; it shows the stronger action at high dose.

TABLE 2
Tissue Biochemistry of *Lindenbergia indica* treated intact rats
(Mean S.E. of 6 values)

Treatment groups	Fructose mg/g		Glycogen mg/g		Protein mg/g		Sialic acid mg/g		Cholesterol mg/g	
	UTERUS	OVARY	OVARY	UTERUS	OVARY	UTERUS	OVARY	UTERUS		
Intact (control) (Group A)	10.01 + 0.21	4.12 + 0.99	222.5 + 3.74	221.25 + 5.20	4.45 + 1.11	3.15 + 1.69	8.83 + 0.38	5.52 + 0.21		
Intact + <i>L. indica</i> Orally for 30 days Low dose - (Group B)	5.35 ^c + 0.66	2.50 ^d + 0.09	66.0 ^c + 3.87	93.33 ^c + 9.68	3.43 ^d + 0.13	2.33 ^d + 0.09	6.73 ^b + 0.35	3.49 ^c + 0.32		
Intact + <i>L. indica</i> Orally for 30 days High dose (Group C)	3.72 ^c + 0.05	2.09 ^d + 0.42	59.12 ^c + 3.12	83.62 ^c + 8.12	2.45 ^d + 0.11	2.01 ^d + 0.10	4.22 ^c + 0.39	3.12 ^c + 0.33		

a = $p < 0.05$; b = $p < 0.01$; c = $p < 0.001$; d = $p < \text{non-significant}$

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ORYZA SATIVA AND ITS MEDICINAL VALUES – A REVIEW

O.P.Singh, Ramji Singh, S.K.Singh and U.S.Singh*

Abstract: Ayurvedic classics describe three groups of rice viz. śāli, ṣaṣṭhika and vr̥hīdhānyam along with their classification and qualities. Modern researchers have confirmed the findings of ancient oriental folk physicians that eating of brown rice is a source of serenity and tranquility. Rice is 98% digestible. Rice starch is different from other grain starches as it contains 100% amylo pectin; this makes rice ideal health food of speedy and healthy assimilation. Rice is a major part of most Asian diets often eaten with nearly every meal; and that adds up to 300-400 pounds per person each year according to Asia Rice Foundation.

Introduction

Rice (*Oryza sativa*) is much revered oriental food and an important tropical cereal. It is the staple food of about half of the human race and is often the main source of calories. Rice from which husk is removed but layers of bran and most of germ by power machinery is known as milled rice. Rice from which husk, germ and bran layers are partly removed without the use of power machinery is known as hand-pounded rice. Rice milled to a high degree and then coated with some foreign substances such as glucose and talcum is called polished rice. Paddy specially processed by steaming or soaking in water, then heated and dried is called par boiled paddy. It can then be milled to various degrees or home pounded.

Ayurvedic description

Ayurvedic classics describe three groups of rice i.e. śāli, ṣaṣṭhika and vr̥hī.

Śāli rice

The several species of śāli group of rice are sweet (madhura) in taste, cold (śīta) in potency (vīrya); light in digestion and promote the strength. They subdue the pitta and slightly generate vāta and kapha. They are demulcent (snigdha) and tend to constipate the bowels and reduce the quantity of faecal matter. Of these the red species (lōhitaka) is the most efficacious and subdues the deranged humours. It is diuretic, spermatopoitic, refrigerant, invigorating eyesight, cosmetic, tonic and pleasant. It improves the voice; its efficacy has been witnessed in cases of fever and ulcer and in all other diseases. It is a good disinfectant and antitoxic. The other species differ a little in their properties from the preceding one and are successively inferior in quality in their order of enumeration.

There are several species of śāli rice such as

* Central Research Institute (Ayurveda), 474/6, Sitapur Road, Lucknow 226 020 (UP).

lōhitaka, kaḷama kardamaka, pāṇḍuka, sugandaka, śakunahr̥ta, puṣpāṇḍaka, puṇḍarīka, mahāśāli, śītabhīruk, rōdhrapuṣpaka, dīrghaśūka kāñcanaka, mahiṣamastaka, hāyanaka, dūṣaka and mahādūṣaka.

Ṣaṣṭhika group

The several species of this group are ṣaṣṭhika, kaṅguka, mukundaka, pītaka, pramōdaka, kākalaka, anāspuṣpaka, mahāṣaṣṭhika, cūrṇaka, kuravaka, kēdāraka, etc. They are sweet in taste and in post-digestive taste, and pacify vāta and pitta. These properties are somewhat identical with those of śāli rice in as much as they are constructive tonic, spermatopoitic and increase the kapha. The ṣaṣṭhika is pre-eminently the most efficacious of all the other species and the leaves are astringent in taste. It is light, mild demulcent and imparts strength and firmness to the body. It is astringent (kaṣāya) and sweet (madhura) in digestion and exhibits properties similar to those of red śāli. The remaining varieties are inferior in quality, each succeeding one being inferior to the one immediately following it.

Vrīdhānya

The several species of vrīhīs are known as kṛṣṇavrīhī, śālamukha, jatūmukha, nantīmukha, lavākṣakā, tāritakā, kukkuṭāṇḍakā, pārvataka, pāṭalā, etc. They have sweet and astringent in taste, sweet in post digestive taste and hot (uṣṇa) in their potencies. They tend to slightly increase the secretions of the internal organs and bring on constipation of the bowels. Their general properties are nearly identical with those of the aforesaid ṣaṣṭhikas. The species kṛṣṇavrīhī is the best of them all. It is light, and

the leaves are astringent in taste; the remaining varieties gradually deteriorating in quality.

Śāli rice grown on burnt land is laghu (light) in digestion, is astringent in taste, has pacifying, tends to suppress the emission of urine and evacuation of stool; and reduces the deranged kapha. Śāli rice grown in a jāṅgaladēśa* has slightly blended taste of pungent, astringent, and sweet, and has a shade of bitter. It subdues the deranged pitta and kapha and is a good digestive and stomachic. Śāli rice grown in kaidāra or ānūpadēśa** is sweet in taste with a shade of the astringent. It is tonic and spermatopoitic, aphrodisiac and heavy in digestion. It reduces the quantity of excrement, subdues pitta and increases kapha.

Rice of once transplanted paddy plants (rōpya) or of those transplanted several times in succession (anti-rōpya) is light, easily digested and comparatively more efficacious. It acts as a tonic and no reactionary acidity after digestion. It destroys the deranged humour and is diuretic. Rice of paddy plants, sprouting from the stubbles of a previous harvest is pacifying. It suppresses the evacuations of stool, is bitter

Food value

(Value/100 gm of edible portion)

Moisture	13.31%
Protein	7.5%
Fat	1.0%
Carbohydrate	76.7%
Minerals	0.9%
Fibre	0.6%
Ca	10mg
Phosphorus	190mg
Iron	3.2mg

*Arid or desert-like land with no mountains or hills, has less vegetation, poor water resources and is more breezy.

**Marshy land with more of water, vegetation, very less of sunlight and heat.

and astringent in taste, subdues pitta, easily digestible and generates kapha.

The bulk of rice grain contributes starch. The protein content of the rice is lower than that of wheat but is of superior quality. The ancient and modern oriental healers through traditional medicines have always advocated the use of natural brown rice as a key to youthful health building.

Modern researches

Modern researchers have confirmed the briefs of ancient oriental folk physicians that the eating of brown rice is a source of serenity and tranquility. Rice is about 98 percent digestible, in other words, it is one of the most easily and quickly digestible. Rice starch is different from other grain starches as it contains 100% amylopectin. This makes rice an ideal health food for those who seek speedy and healthy assimilation.

A team of Japanese scientists has found that inducing brown rice to germinate by soaking for several hours before it is cooked enhances its high nutritional value. Their findings were presented at the 2000 International Congress of Pacific Basin Societies in Honolulu. Germinated rice contains much more fibre than conventional brown rice, three times the amount of essential amino acid lysine and ten times the amount of gamma aminobutyric acid (GABA); it contains another amino acid known to improve kidney function. During their research it was also found that brown rice sprouts i.e. tiny buds less than a millimeter tall (1/6 of an inch), contain a potent inhibitor of an enzyme called prolyendo peptidase, which

is implicated in Alzheimers disease. Researchers observed that germination activates enzymes in brown rice all that at once to supply the best nutrition to the growing sprouts.

To make the rice sprout, the researchers soaked it on water at 32° C. (about 90° F) for 22 hours. The outer bran layer softened and absorbed water easily making the rice easier to cook. They report that cooked sprouted rice is sweet flavour because of the liberated enzymes break down some of the sugar and protein in the grain.

Rice, whether brown or white is a major part of most Asian diets often eaten with nearly every meal. That adds up to 300-400 pounds per person each year according to Asia Rice Foundation. Kayahara, China, India and Indonesia are the world leaders in rice production. The expanding population in Asia increases the necessity of boosting the rice production by about a third over the next 20 years.

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**FACTORS INFLUENCING CONTRACT FARMING OF
MEDICINAL PLANT – THE CASE OF COLEUS
(*COLEUS FORSKOHLII*) - IN TAMIL NADU**

N.Raveendaran, N.Ajjan, C. Sekhar and S.R.Rajesh*

Abstract: A study was conducted in Salem District of Tamil Nadu to assess the economic worthiness of cultivation of medicinal plants under contract farming situation. Contract farming has motivated the farmers to take up cultivation of medicinal plants. The factors, which are influencing contract farming, are discussed here with appropriate strategies for promotion of contract farming of medicinal plants.

Introduction

Medicinal plants are the local heritage with global importance. India takes pride in harbouring about 8000 different medicinal plants across its diverse ecosystems and cultures. In India, medicinal plants have made a good contribution to the development of ancient Indian *Materia medica*. India has been using its rich biodiversity in the health care segment for many years. Its rich traditional experience and wisdom are established comfortably in the ayurveda and siddha systems of medicine. During the past century there has been a rapid extension of the allopathic system of medicine in India. It generated commercial demand for pharmacopoeial drugs and their products in India.

Medicinal plants have curative properties due to the presence of various complex and chemical substances of different compositions,

which are found as secondary plant metabolites in one or more parts of these plants. These plant metabolites, according to their composition, are grouped as alkaloids, glycosides, corticosteroids, essential oils, etc. A few new medicinal plants have successfully passed the tests of commercial screening due to massive investments made by pharmaceutical industries. The benefits of these efforts would reach the masses in future, if farmers indicate commercial cultivation.

Exports of ayurveda and siddha products and services offer huge potential as over 80 percent of the world population relies on the traditional systems of medicines to meet their primary health care needs. World demand for herbal products has been growing at the rate of 10 per cent to 15 percent per annum. There is also a growing demand for natural products, including items of medicinal value in the

* Centre for Agricultural & Rural Develop. Studies (CARDS), Tamilnadu Agricultural Ucity, Coimbatore-3

international market. The medicinal-plants-related trade in India alone is approximately Rs.5.5 billion. In China, 40 per cent of the total medicinal consumption is attributed to traditional medicines (Dasture, 2002).

Developed countries, in recent times, are turning to use traditional medicines that involve herbal drugs and remedies. According to a recent survey in the member states of European Union, about 1400 herbal preparations are used widely. Herbal preparations are popular and are on significance in primary health care in Belgium, France, Germany and Netherlands (Dasture, 2002). It has estimated that the global market for herbal products, which include medicines, health supplements, herbal beauty products, toiletries, etc. are around US \$ 62 billion. Out of this, the market for herbal medicine alone is estimated at around US \$ 5 billion and is expected to reach US \$ 16 billion by 2005. (Qudsia Gandhi, 2002)

Global markets are concentrated mainly in Europe and North America which together account for 63 per cent of the world market. The European market for herbal remedies accounts to 45 per cent of the global market and that stood at US \$ 7.5 billion in 1997 (Qudsia Gandhi, 2002). Germany and France are the most established markets with a share of 22 percent and 11 percent in Europe respectively. China is the major exporter of traditional medicine to the world market. India could get part of this market share if it organizes well its production and marketing efforts.

In the last 10 years India's export of medicinal plants has trebled. But, with most of these plants being taken from the wild, hundreds of species are now threatened with extinction due to over

harvesting which calls for efforts to preserve the endangered species. Therefore, preservation and commercialization are needed to sustain the population of endangered species.

Coleus

Coleus is an Indian medicinal plant. It is a perennial aromatic herb growing wild throughout Simla eastwards to Nepal, in the hills of Bihar, Gujarat and Peninsular India. This is being cultivated in Maharashtra and Gujarat and Tamil Nadu for edible roots.

The synonym of Coleus is *Plectranthus barbatus*, and its vernacular name in Tamil is *Marundhu koorkan*. It is an aromatic perennial, with tuber like roots and an erect stem, reaching 60 cm. The part used is root and the chemical constituent present in Coleus is volatile oil and diterpenes. It is used for lowering blood pressure, anti-spasmodic, dilates the bronchioles, dilates the blood vessels and used as heart tonic.

In Tamil Nadu, Coleus is being commercially cultivated by contract farming method in about 1250 acres. The districts, which are cultivating Coleus, are Salem, Villupuram, Thiruvannamalai, Namakkal and Perambalur. Tamil Nadu is blessed with different agro climatic regions for growing many medicinal and aromatic plants. Lack of awareness on potentialities of medicinal plants, inadequate technology for value addition, lack of proper agro techniques for most of the medicinal plants and absence of price support and incentives are some major reasons for reluctance of farmers to cultivate medicinal plants. To make contract farming a successful one, the farmers must be assured with remunerative price with buy-back arrangements of products, supply of

inputs in time backed up with technical guidance. Accordingly, contract farming is being practiced for Coleus studied in depth to popularize the same so as to create awareness on medicinal plants. Keeping this in view, an attempt is made in the present study to: i) analyze the cost and returns associated with cultivation of medicinal plants, ii) analyze the factors influencing cultivation of Coleus, iii) examine the advantages and disadvantages of contract farming in Coleus and iv) suggest appropriate policy measures, for expansion of area under Coleus and its trade in Tamil Nadu

Methodology

Coleus cultivation is predominant in Salem district and thus the district was chosen purposively. Athur taluk of Salem district was selected in the first stage as it had maximum number of farmers cultivating Coleus. In this taluk, the village-wise list of Coleus growers were obtained from the records of revenue officials and from the MGP Associates, Salem who are the promoters of the crop in the district in the second stage. Accordingly, only 5 villages were found ranking top in the list of number of Coleus cultivators viz. Kulathoor, Manjini, C Villunthan Colony, Allathoor, and Parathoor. From these, 10 Coleus growing farmers were selected at random from each village in the third stage to cover 50 samples from five villages following three stages random sampling technique. Personal interview was the method adopted using structured questionnaire designed for the purpose to collect the required data from 50 farmers.

In analysing the costs and returns, the concept adopted by Directorate of Economics and Statistics, New Delhi was adopted viz., cost A, cost B, cost C.

Cost A: Includes seeds, hired human labour, machine labour, inorganic fertilizers, organic manures, plant growth regulators, land revenue, depreciation on farm implements and machineries and interest on working capital.

Cost B: Includes cost A plus rental value of own land and interest on fixed capital.

Cost C : includes cost B plus imputed value of family labour.

Result and discussions

The results and discussion in respect of Coleus cultivation are furnished under the following heads.

Cost and returns of Coleus

Cost of production and returns is vital in any farm management study, as the farmers would like to choose and adopt the crops that would give higher returns. It would also help the farmers to decide on the possible reallocation of the resources by choosing the crops that had performed well in their farms and thus had led to increase profitability. Hence, a detailed analysis was undertaken to estimate the cost of production and returns associated with Coleus. The results are presented in Table - 1.

From the table it could be seen that Cost A1 (operational cost), constituted the bulk of the total cost of Coleus cultivation. It amounted to Rs.29872 per ha i.e., 64 percent of total cost. Among this hired human labour constituted the maximum share of 21 percent followed by organic manure 13 percent, inorganic fertilizers 12 percent and machine labour 10 percent. The rental value of owned land under cost B constituted 24 per cent of the total cost of cultivation. The total cost of cultivation (i.e. cost C) was Rs.46735 and the gross returns was Rs.96970. The input output ratio was

1:2.07 with a net return of Rs.50235 per ha. The cost of production per tonne was Rs.1968 and the price of produce was Rs.4000 per tonne. In respect of cultivation of Senna and Periwinkle, the cost of production per tonne was worked out to be Rs.2070 and Rs.2090 respectively (Ajjan *et. al*, 1998).

Thus it is concluded that cultivating Coleus under farmland situation is economically a viable enterprise.

Factors Influencing contract farming

Factors influencing contract farming are studied under two heads viz. i) factors in favour of

contract farming and ii) factors that affect the contract farming.

Under contract farming, the farmers enter into contract by executing a bond with the buyer for supplying the final product with agreed prices. The buyer provides the farmers the plant materials. Buyer arranges loan for farmers for undertaking various operations and buying inputs. Besides, the buyer provides all the technical guidance during the crop period. The buyer who entered an agreement with the producers is MGP Associates, Salem and

TABLE 1
Cost and returns of Coleus
(Rs per hectare)

Sl.No	Particulars	Amount (Rs)	Percentage
01	Seeds	1625	3.48
02	Hired Human Labour	9818.3	21.01
03	Machine Labour	4666.4	9.98
04	Inorganic Fertilizers	5458.5	11.68
05	Organic Manures	6137.75	13.13
06	Plant Growth Regulators	344.35	0.74
07	Land Revenue	157.75	0.34
08	Depreciation on Farm Implements and Machineries	1664	3.56
09	Interest on Working Capital @ 12 % p.a	3584.646	7.67
10	Cost A	29872.05	63.92
11	Rental Value of Own Land	11250	24.07
12	Interest on Fixed Capital @ 11 % p.a	1237.5	2.65
13	Cost B	42359.55	90.64
14	Imputed Value of Family Labour	4375	9.36
15	Cost C	46734.55	100.00
16	Yield in Tonnes Per Ha	23.75	
17	Gross Returns	96969.7	
18	Net Returns	50235.15	
19	Input-Output Ratio	1:2.07	
20	Cost of production (Rs per tonne)	1967.77	
21	Price of Produce (Rs per tonne)	4000.00	

because of their untiring effort, the area under Coleus is on the increase.

Selected farmers were enquired about the probable reasons for preferring contract farming and the details are presented in Table 2. It revealed that assured prices, acceptance of the product without any negligence, provision of constant technical guidance and timely provision of the seed materials are the principal reasons to go for contract farming. Among these reasons, assured price accounted is for 80 percent. All others are accounted for only 76, 70 and 50 per cent respectively. About 40 percent of the farmers preferred an immediate settlement. Thus contract farming assured the farmers with adequate price security and buyback arrangement with accepted quality whereby the farmers were freed from shackles of price risk and lack of technical guidance. Despite the innumerable advantages in contract farming, about 90 per cent of farmers were also dissatisfied with the constant price provided by the buyer for the past five years. Since there are no other private traders other than the single buyer, about 60 percent of the farmers opined that they are left with no choice other than approaching the contractor to sell out their product.

TABLE 2
Reasons to go for contract farming
(N=50)

Particulars	No. of farmers	%
Assured Price	40	80
Acceptance of the product	38	76
Provision of technical guidance	35	70
Provision of the seed material	25	50
Immediate settlement	20	40
Arrangement of finance	17	34

Reasons for continuing Coleus cultivation

The opinion of selected farmers on continuing the cultivation of Coleus in future were also sought (Table 3). Profitability, less labour requirement and suitability to their soil were the major reasons that forced them to continue the cultivation in future as reported by more than 70 percent of farmers. Assured market and less pest incidence were the other reasons pointed out by more than 50 percent of the selected farmers. According to Ajjan *et.al* 1998, minimum attention required, low risk and profitability are the reasons to choose cultivation of Senna in the farm holdings.

Substitution of crops by Coleus

The crops substituted by Coleus in the study area were cotton, paddy and tapioca which were accounted for 54, 30 and 16 percent of the total respectively (Table 4). Coleus had replaced cotton and paddy to a major extent and tapioca

TABLE 3
Reasons for continuing cultivation of coleus
(N=50)

Particulars	No. of response	Percentage
More profitable	45	90
Less labour	35	70
Suitable to the soil	35	70
Assured market	32	64
Pest resistance	26	52

TABLE 4
Crops substituted by coleus

Crops	No. of response	Percentage
Cotton	27	54
Paddy	15	30
Tapioca	8	16
Total	50	100

to a lesser extent. It is a welcoming sign that crops with heavy water requirement like paddy is replaced and crops like cotton causing maximum pollution are replaced by Coleus besides resulting in maximum profit.

The profitability of competing crops furnished highlights the economic advantage of Coleus cultivation (Table 5). It revealed that among the agricultural crops chosen for comparison, cotton performed better in respect of input-output ratio. Whereas, in absolute value terms, Tapioca performed better with higher input cost and hence the lower input-output ratio. Similar is the case of Coleus cultivation. Coleus is capable of generating around Rs.97000 as gross income per ha accompanied with higher input costs of Rs.46734 resulted in low input-output ratio.

It revealed that higher returns is possible if we compare the cultivation of Coleus with other crops using operational cost alone, which is often incurred by the farmer under a given environment. So, there is a chance of realizing Rs.67000 as net income per ha with an input - output ratio of 3.24 revealing worthiness to take up cultivation.

Conclusion

Results of the study revealed that contract farming in Coleus has enhanced the profitability

TABLE 5
Economics of competing crops by coleus

Crops	Total cost	Gross return	Input-output ratio
Cotton	19448	24954	1:1.28
Paddy	22306	27691	1:1.24
Tapioca	30179	38894	1:2.07
Coleus	46734	96969	1:2.07

of farmers in the selected area compared to the existing crops raised by them.

Assured remunerative market price, acceptance of the product, provision of technical guidance, better seed materials, immediate settlement and arrangement of finance were found to be the major advantages of contract farming. Besides, higher profitability, less labour requirement, lower pest incidence and suitability to the soil were the other factors responsible for their decision to continue Coleus cultivation in future. Farmers were not satisfied with the constant price for the past five years and lack of other buyers forced them to sell their product under monopoly situation.

Strategies

1. It is suggested that the practicability of this type of contract farming has to be expanded to other suitable areas with adequate infrastructure facilities, for other medicinal plants so that endangered species could be saved and commercially cultivated, besides going for export.
2. It is also suggested that contractor should revise the price of the product every couple of years considering the market volatility so as to enthuse confidence in the minds of the farmers for their continuance in cultivation.
3. Medicinal plants for cultivation could be so selected that they substitute crops with heavy water requirements so that cultivation could be continued without any problem with limited water availability.
4. Studies related to market potential of important medicinal plants and their demand for supply is lacking. The medicinal firms/ organizations both in private and Government

should come forward to make tie-up with the research institutions so as to assess the real situation which in turn promote cultivation and trade of medicinal plants.

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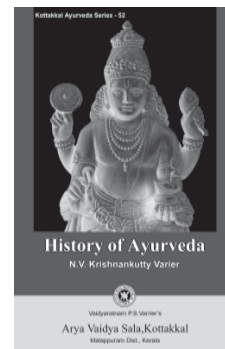
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CLINICAL EVALUATION OF *SWERTIA CHIRATA* IN THE TREATMENT OF *P. VIVAX* MALARIA

Ashok K. Panda, P.C. Tripathy* and Amitabha Nandy**

Abstract: Kirātatiktā (*Swertia chirata*), one of the genuine medicinal herbs having antipyretic property (jvaraghna), is indicated in many ayurvedic formulations for the management of diseases like complicated fever (sannipāta), etc. This preliminary study reveals the anti-malarial parasitic effect of kirātatiktā.

Introduction

Malaria is said to be the fourth biggest killer, mostly affecting people 'marked by poverty'. It has been reported that annually there are about 500 million cases of malaria and 2.7 millions deaths due to this disease in global level. However, after the development of the commonly used anti malarial drug Chloroquine, the hazardous situation of this ailment is gradually lessening, more particularly in the South East Asian countries. Of the total cases of malaria reported in India, 65% are due to *P. vivax* and 35% are due to *P. falciparum*. Comparatively *P. vivax* cases have high morbidity, labour loss and repeated relapses whereas *P. falciparum* causes complicated illness and even death. India has 7.8% tribal population and this population contributes 40% of the total malaria cases². Under this background, developing a herbal remedy for

malaria has more prominence. In this connection, the report of recent development of a new anti-malarial drug (Artemecine derivatives) from Chinese medicinal plants draws more attention to search for a drug having anti-plasmodia action from Indian medicinal plants.

Kirātatiktā has jvaraghna³ (antipyretic) property and is indicated in the treatment of sannipātajvara (complicated fever)⁴. The pharmacological study of this drug reveals its antipyretic activity⁵. It is the main ingredient of proven ayurvedic anti-malarial drugs viz. Sudarśanacūrṇa⁶ and Āyus-64⁷. It has reported that the tribal people of Orissa have been using the decoction of *S. chirata* in the management of irregular fever with rigors⁸. So, the present study was conducted with a view to assess the therapeutic efficacy of kirātatiktā for the management of *vivax* malaria.

* Institute of Post Graduate Ayurveda Education & Research. Kolkata-9

** Calcutta School of Tropical Medicine. C.R. Avenue. Kolkata-73

Materials and methods

After the permission obtained from the Ethical Committee of the institute for the study, the patients were selected from the O.P.D of the Institute of Post Graduate Ayurveda Education and Research (S.V.S.P Hospital), Kolkata following a preset exclusion and inclusion criteria. Every patient's blood was screened for malarial parasite at Calcutta School of Tropical Medicine, Kolkata and only *P. vivax* positive cases were selected. The study was a prospective open level clinical trial and patients were selected incidentally on a random basis. Children below the age of 12 years, pregnant and lactating mothers, old aged persons and complicated cases were excluded. Any person who was not willing to take herbal medicine or person showing either no sign of improvement or deterioration of clinical and parasitological condition were allowed to withdraw from the study at any time. Each subject included was explained about the aims and objectives of the study and an informed written consent was obtained from them.

Air-dried powder of *S. chirata* was prepared in the form of tablet and the patients were treated in a dose of 50 mg/kg/day in two divided dose for 5 days⁹. Each tablet contained 500 mg powder. The patients were observed for a period of two month clinically. Follow up slides were collected on the 6th day and patients were advised to report in case of any febrile episode within two months. The numbers of asexual parasites were counted against 200 leucocytes. The parasite load was calculated per microliter using the W.H.O formula¹⁰. The clinical assessment was done by body

temperature, chills and rigors, headache, vomiting/nausea and cough/cold.

Results and discussion

During the study, of 41 cases of fever screened, 14 cases were excluded on the basis of inclusion and exclusion criteria; and the remaining 27 patients were subjected to parasitological investigation to conform *vivax* malaria. Out of 27 patients, only 18 yielded positive result. The maximum patients were males (12 - 66.66%)

TABLE 1

Age and Sex distribution of positive *p.vivax* cases

Age	Male (%)	Female (%)	Total (%)
15-25	2	1	3
26-35	5	3	8
36-45	3	1	4
46-55	2	1	3
Total	12	6	18

TABLE 2

Sign and symptoms observed before and after the treatment

Sign & Symptoms	NUMBER OF PATIENT		% relief
	before Rx	after Rx	
Fever every 3rd day	14	5	64
Chills and rigors	17	1	94
Headache	11	1	90
Vomiting & nausea	6	1	83
Cough & cold	5	0	100
Palpable spleen and Liver	2	2	0
M.P. Positive	18	6	66

as compared to females (6 - 33.33%). The majority of patients (14 - 78%) were having fever every third day. All the studied cases had fever at the time of attending the clinic and out of them 17 (95%) had chills and rigors; headache was a common symptom found in 11 cases, while 6 patients had vomiting and nausea. Only 5 cases had cough and cold, and 2 patients palpable spleen and liver.

Out of 18 M.P. positive cases, 12 (66%) were parasite free on the 6th day and rest 6 (33%) of the cases also had significant response in terms of reduction of parasite load. Febrile

episode was not found in 13 treated cases, whereas headache, vomiting, nausea, cough and cold were completely relieved in 10, 5 and all cases respectively. Splenomegaly and hepatomegaly did not show any improvement by sixth day. On this basis 12 cases had adequate clinical response and 6 cases had minimum clinical response.

There were no early and late treatment failure cases in this study. Remaining 6 cases of reduced parasite load were also continued on the same treatment for another 3 days. On the 9th day 6 cases also were found parasite free and clinically all right. No patient reported about an illness during two months post treatment observation period. It was clear from the preliminary study that *S. chirata* has anti parasitic effect, but the mechanism of action is not clear. There is a doubt whether it has direct parasite killing effect or acts indirectly through stimulation of host immune system. In-vitro drug assay on malaria parasite culture would provide a direct insight into parasitocidal activity.

The results of the study were encouraging; it needs a large-scale controlled and double blind clinical trial to further study and substantiate the usefulness of *S. chirata* in the cases of vivax malaria. It is strongly recommended to find out the active constituents of this drug responsible for parasitocidal activity.

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TABLE 3
Parasite load of individual patients
before and after the treatment

Patient No.	PARASITE LOAD	
	before treatment	after 6 days treatment
1	2,210	Nil
2	5,400	Nil
3	9,400	110
4	10,560	Nil
5	9,400	Nil
6	5,600	220
7	7,600	110
8	8,800	Nil
9	9,600	Nil
10	2,220	110
11	6,600	Nil
12	5,600	Nil
13	10,560	330
14	8,800	Nil
15	9,600	220
16	3,400	Nil
17	7,700	Nil
18	5,500	Nil

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STUDY OF HAEMATO BIOCHEMICAL ANALYSIS OF SERUM OF HELMINTH INFESTED GOATS DURING THE COURSE OF TREATMENT WITH A COMPOSITE HERBAL EXTRACT

S.S. Talokar, A.A. Deshmukh, V.P. Vadlamudi, R.A. Vasulkar and N.G. Shende*

Abstract: Helminthiasis has been one of the major livestock health problems reducing the production and lowering the health status of animals. This paper deals with the investigation of anthelmintic efficacy of a composite herbal extract in the treatment of helminth-infested goats.

Introduction

Helminthic infestation reduces the production and lowers the health of animals. It not only damages the host, but also predisposes the host to other infections. Worm infestation can cause various types and degrees of haematological and biochemical changes resulting into interference with the host metabolism causing significant metabolic derangement which ultimately affects the growth and productivity of goats. So the haemato-biochemical constituents have direct relation with the metabolic function and health status of animals. Any alteration in the normal haematobiochemical values of animals is indicative of ill health status of animals. This investigation is an attempt to analyse the haematobiochemical changes in the helminth infested goats treated with compound herbal extract.

Materials and methods

The different plant materials selected for this study were 1. Seeds of *Artemisia maritima*, 2. bark of *Azadirachta indica*, 3. seeds of *Butea frondosa*, 4. fruits of *Embelia ribes*, 5. seeds of *Nigella sativa*, 6. bark of *Ocimum sanctum* and 7. fruits of *Piper longum*.

The plant materials, Sl. No.1, 3, 4 and 7 of above, were purchased from an ayurvedic medicine dealer from the local market. The other plant materials were obtained from the Nagarjun Medicinal Plants Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The freshly collected plant materials were shade dried at room temperature, powdered, sieved and the aqueous extract prepared. The extract was completely evaporated on hot plate and care was taken to avoid charring.

Ramteke (2002) reported 100 per cent efficacy

* Dept of Pharmacology and Toxicology, Post Graduate Institute of Veterinary Sciences, Akola - 444 004.

of the compound herbal powder formulation administrated at 10g oral dose/animal/day in both sheep and goats. The 10g compound herbal powder formulation was equivalent to 1.43g of powder of each of the seven plant materials. Therefore, based on the percent extractability, 1.43g powder of seeds of *A. maritima*, bark of *A. indica*, seeds of *B. frondosa*, fruits of *E. ribes*, seeds of *N. sativa*, bark of *O. sanctum* and fruits of *P. longum* was equivalent to 0.3575, 0.1859, 0.3003, 0.1001, 0.1716, 0.1144 and 0.1716 g of the respective aqueous extracts; this roughly totaled to 1.40g. A preliminary trial was conducted using worm-infested goats, which were administered with the compound herbal extract at the oral dose of 1.40g /animal/day. Examination of their faecal scores revealed about 30 per cent reduction in EPG after 5 days of treatment. For the final trial, the dose was double and was selected as 2.8g/animal/day, extending the treatment period up to 10 days. The extract was dissolved in water and administered to the goats by drenching. Blood samples were also obtained from jugular vein puncture. The various haematological

estimations included in the study were as follows:

1. Haemoglobin (Sahli's method)
2. Packed cell volume (Microhaematocrit method)
3. Red blood cell count
4. Differential leucocyte count

The following blood biochemical parameters determined using diagnostic kits (Span Diagnostics Pvt. Ltd. Udhana) following the procedures as detailed in the accompanying leaflets.

1. Serum total protein (Biuret method)
2. Blood urea nitrogen (DAM method)
3. Serum glutamic oxaloacetate transaminase (Reitman and Frankel method)
4. Serum glutamic pyruvate transaminase (Reitman and Frankel method)

Results and discussion

From haematological observations, it is seen that there was only a marginal increase in the haemoglobin levels of the goats after mid treatment. However, statistically there was a significant increase at the end of the ten-day treatment as compared to the pre-treatment haemoglobin level. (Table 1) Similar was the

TABLE 1
Haemtological observations of helminth infested goats treated with a composite herbal extract

Sl. No	Haematological parameter	Pre-treatment	Mid-treatment	Post-treatment
1	Haemoglobin (g/dl) Hb (g/dl)	7.68 + 0.14	8.10 + 0.17	8.43 + 0.19
2	Packed cell volume (%) PCV (%)	23.00 + 0.57	24.66 + 0.80	26.16 + 0.79
3	Total red blood cell TLC (millions/micro litre)	7.73 + 0.11	7.93 + 0.14	8.16 + 0.15
Differential leucocyte counts:				
1	Neutrophils (%)	35.17 + 0.48	33.89 + 0.75	29.00 + 0.36
2	Lymphocyte (%)	56.33 + 0.50	60.67 + 0.67	66.67 + 0.56
3	Eosinophill (%)	6.67 + 0.57	4.00 + 0.26	2.00 + 0.26
4	Monocyte (%)	1.33 + 0.21	1.33 + 0.21	1.83 + 0.17
5	Basophill	0.50 + 0.34	0.33 + 0.21	0.50 + 0.23

trend with regard to both haematocrit value and total erythrocyte count. The levels of haemoglobin, haematocrit and erythrocyte count at pre-treatment suggested that all the helminth-infested goats were anaemic. Several other research workers reported anaemia characterized by low haemoglobin, haematocrit value and erythrocyte count under worm infestation in livestock (Thakur and Mishra, 1973; Panda and Mishra, 1980; Singh *et al.*, 1984; Malti *et al.*, 1999; Mishra *et al.*, 2000). The anaemic changes in gastrointestinal parasitism are due to haematophagous nature of the worms, especially the *Haemonchus contortus*.

The data of differential leucocyte count indicated significant reduction in neutrophils and eosinophil counts and increase in lymphocyte count following treatment with the compound herbal extract as compared to the respective pre-treatment counts among the helminth infested goats. It is also noted that the pre-treatment differential leucocyte count was characterized by neutrophilia, lymphocytopenia and eosinophilia. These observations are in agreement with earlier reports of helminthiasis in animals (Thakur and Mitra, 1973; Panda and Mishra, 1980 and Maiti

et al.,1999). These changes were due to stress of parasitic gastroenteritis and allergenicity of parasitic infestation (Benzamin, 1986). The treatment with the compound herbal extract tended to reverse the differential leucocyte count to normal levels as a consequence of the anthelmintic action as discussed. The mean biochemical levels among the helminth infested goats at pre-treatment, mid-treatment and post-treatment with the compound herbal extract are detailed in Table 2.

Serum total protein

The protein levels during the three intervals ranged from 6.10+0.10 to 6.60+0.11 g/dl. The post treatment protein level (6.60+0.11 g/dl) was significantly higher than the pre-treatment level and statistically similar to the mid treatment level. The mid treatment protein level was statistically similar to pre-treatment serum total protein level.

Gastrointestinal parasitism in animals has been reported to result in hypoproteinaemia (Pradhan and Day, 1999; Bharati and Prasad, 2001). Therefore, the observed increase in serum total protein level could be due to suppression of the worm load by treatment with the compound herbal extract.

TABLE 2
Biochemical observations of helminth infested goats treated with the composite herbal extract

Sl. No	Biochemical	Pre-treatment	Mid-treatment	Post-treatment
1	Serum total protein	6.10 + 0.10	6.26 + 0.09	6.60 + 0.11
2	Blood urea nitrogen	33.78 + 1.55	29.90 + 0.86	25.78 + 0.74
3	SGOT	47.50 + 1.16	49.5 + 0.58	50.21 + 0.65
4	SGPT	21.13 + 0.86	21.41 + 0.96	23.21 + 0.99

Blood urea nitrogen

The mean BUN levels at treatment, mid-treatment and post-treatment were 33.78+1.55, 29.90+0.86 and 25.78+0.74 mg/dl respectively. The BUN levels at mid-treatment and post-treatment were significantly lesser than the pre-treatment BUN level. This might be due to improved renal efficiency since all the medicinal plants used in the formulation of the extract are recognized to be beneficial in renal insufficiency and induce diuresis (Nadkarni, 1954, Kirtikar and Basu, 1975).

Serum transaminases

The mean serum glutamic oxaloacetate transaminase (SGOT) levels at pre-treatment, mid-treatment and post treatment were 47.50+1.16, 49.5+0.58 and 50.21+0.65 IU per litre respectively. The mean serum glutamic pyruvate transaminase (SGPT) levels at pre-treatment, mid-treatment and post-treatment were 21.13+0.86, 21.41+0.96 and 23.21+0.99 IU per litre respectively. The variations in the

activities of both the enzymes at different intervals of the study were not statistically significant. Therefore, helminth infested goats as selected in the present study could be free from liver pathology and/ or liver fluke infestation.

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held at Kottakkal on 24 and 25 of February, 2002

The book contains papers by M.S. Swaminathan, Malti M. Sinha, M.S. Valiathan, Sukh Dev, R.Kumar, S.K. Mishra, P. Pushpangadan, K.D. Sharma, K. Rajagopalan, D.B. Ananta Narayana, P.M. Varier, K.Anil Kumar, Darshan Shankar, C.R. Agnives and K. Muraleedharan.

Price - Rs.120/-



EVALUATION OF NIDĀNA AND SAMPRĀPTI IN THE CASE OF TAMAKAŚVĀSA (BRONCHIAL ASTHMA)

K. Bharathi, K. Gopakumar* and R.K. Swamy**

Abstract: Tamakaśvāsa is one of the most distressing diseases. It is reported that in India 15-20 million people are suffering from this disease. This is quite common ailment affecting in all socio-economic strata in all age groups, but predominantly in the early life. It occurs mainly due to the mithyāhāra vihāra, daihika - mānasika kāraṇas, changes in ṛtu, kāla, dēśa, etc. Nidāna, samprāpti, rūpam, sādhyāsādhyata and cikitsā of tamakaśvāsa have been described elaborately in a scientific manner centuries ago in Ayurvedic Samhitas that are now widely accepted by other systems of medicine. It is highly essential to research the role of nidāna of the illness for the prevention and effective management of this burning problem. Hence, an attempt has been made to evaluate in detail the role of different nidāna factors of tamakaśvāsa in 50 patients.

Introduction

Tamakaśvāsa is prevalent as a worldwide disease. Nearly 5-10% of the population suffers from this disease at some stage of their life predominantly in early life. It is estimated that in India 15-20 million people are suffering with asthma. It has reported that deaths due to this ailment has reached over 180,000 annually. The incidence is still increasing due to apathyāhāra vihāra and changes in dēśa, kāla, ṛtu i.e. increased global pollution, stressful modern life style, faulty methods of living and various other reasons.

This disease entity has recognized since ancient times and references are made in ayurvedic

classics to nidāna, samprāpti, rūpa, sādhyāsādhyata and cikitsā of this problem from the Bṛhatrayī period. The descriptions of tamakaśvāsa given by the ancient preceptors are very comprehensive and scientific.

While describing the general samprāpti of śvāsa, ayurvedic classics explain the causative factors such as: intake of vidāhi, guru, viṣṭambha, rūkṣa, abhiṣyanda, vāta, kapha vardhaka ahāras; viṣamāśana, āmadōṣa, śītapāna, śīta āśana; exposure to rajō, dhūma, ātapa, anila; residing in śītasthāna; excessive vyāyāmakarma, bhāra and advā, apatarpaṇam, vēgāghāta, udāvarta, marmābhighāta, pratiśyayā, jvarā, viṣūci, alasāka and vibandha.

*Dr. A. Lakshmi pathi Research Centre for Ayu., VHS Medical Campus, TTTI Post, Taramani, Chennai – 13

** Asst. Director, RRI, IGMS Complex, Labbipet, Vijayawada, AP 520 010

Specifically for tamakaśvāsa it is said that, this condition gets aggravated by mēghāmbu, śīta and prāgvāta. In specific different food materials and faulty methods of living, environmental and mechanical factors are observed as triggering factors. Asthma due to above said factors is called as Atopic Asthma, which is single largest risk factor. Environmental (inhaled) allergens and food (ingested) allergens trigger the disease through the formation of antigens. A positive family history of Atopy is common and Asthmatic attacks are often preceded by allergic rhinitis, urticaria or eczema.

Air born antigens enter the bronchi with the inspired air and the reaction occurs first on sensitized mast cells on the mucousal surface. The mediator release opens the mucousal inner cellular tight junctions and enhances penetration of antigen to the more numerous submucousal mast cells. In addition, direct stimulation of sub epithelial vagal receptors provokes broncho constriction through both central and local reflexes.

Ingested (food) allergens such as curd, fish, milk, etc., presumably reach the bronchi via the blood stream. This will stimulate the formation of Ig-E antibody, and an anaphylactic antigen antibody reaction in the bronchi may follow; the same will be repeated on further exposure to specific allergen. This causes the release of pharmacologically active substance from mast cells in the bronchial wall, which provoke the bronchial constriction and an inflammatory reaction of allergic type in the bronchial wall (oedema) and mucous secretion.

This disease so difficult to treat that it poses quite a number of clinical problems, which in certain cases, may lead to fatal complications; hence prevention is the best thing to adopt in this condition. Ayurveda is a prevention

oriented health system. It identifies the fundamental cause of imbalance and disease as violation of natural law; indulging into asātmya āhāra, vihāra and mānasikacintā, etc. are few example. Therefore, all therapeutic and preventive methodologies of Ayurveda aim at bringing physiological and psychological function in accord with natural law and thereby maintaining balance and promoting the optimal function of the body. Likewise, for tamaka śvāsa also different āhāra, vihāra, dēśa, kāla, ṛtu factors are described in the nidāna.

Here, an attempt has been made to evaluate the role of specific āhāra, vihāra and dēśa, kāla, ṛtu factors, and bala, kāla samprāpti of tamakaśvāsa.

Materials and methods

Total 50 patients were taken up for the study, according to the inclusion criteria after thorough clinical examination and laboratory investigations. Analysis has been done for particular antigen of food factors, environmental and seasonal factors.

Inclusion criteria

1. Difficulty in breathing.
2. Episodic attacks of dyspnoea.
3. Wheezing sounds.
4. No or difficult expectoration.
5. Relief of dyspnoea in erect position or after expectoration.

Exclusion criteria

1. Cardiac asthma or history of acute attacks which needed treatment with life saving drugs; oxygen, steroids, etc.
2. Lung pathology of other nature.
3. Tuberculosis.
4. Pleurisy.
5. Hydrothorax.
6. Pneumothorax.
7. Pyothorax.

8. Malignancy.
9. Tropical pulmonary eosinophilia.
10. Diabetes mellitus.
11. Severe systemic disease.

Discussion

Of fifty patients, the number of patients in the age groups of 51-60 (14) and 41-50 (12) were found more suffering with reference to āhāra factors. During the study 42 (84%) patients were given statement that due to the change of the diet they got the attack frequently. It was also found that with the usage of some varieties of śākavarga (vegetables), especially raktamāci, vṛndāka, ambaṣṭakī, bhiṇḍitakī and trapusa, the patients were troubled with immediate attack. The details of the attack graded are 8 (16%) each with raktamāci and vṛndāka, 4 (8%) with ambaṣṭakī, and 2 (4%) each with bhiṇḍitakī and trapusa respectively. As far as intake of the phalavarga (fruits) is concerned, it was observed that kadaḷīphala in 8 (16%) patients, āmra in 2 (4%), nāraṅgaka, nārikēla, jambhīra in 6 (12%) were the triggering factors. Apart from these, intake of madhurapadārtha found as the causative factor in 6 (12%) patients, amlapadārtha in 2 (4%), dadhī in 1 (2%), tailabrṣṭa āhāra in 4 (8%), vidāhi, viruddha āhāra in 6 (12%), śīṭala padārtha in 6 (12%) and amlīka/kuthitha āhāra, apatarpaṇam in 2 (4%).

The other causative factors observed were: rajāmsī/dhūli (dust) in 16 (32%) patients; talcum powders in 2 (4%) were also claimed as causative items from the mechanical factors. From the category dhūma (smokes), it is observed that traffic pollution was the contributory factor in 22 (44%) patients, perfumes in 12 (24%), smoking of tobacco in 4 (8%), usage of different types of soaps in 2 (4%) and oil fumes in 4 (8%). Change in ṛtu

(season) was one of the other important reasons found in 36 (72 %) cases. Among the other reasons, presence of mēghāmbu (cloudy weather) found as the causative factor in 14 (28%) patients, exposure to ātapa in 4 (8%) and residing at ānūpadēśa in 24 (48%) patients.

It was also interested to observe that daihika kāraṇas such as kḷama (12%), advā (4%), bhāra (4%), vibandha (34%); and mānasika kāraṇa (52%) are also triggering factors of the attack of tamakaśvāsa. Other than these factors, intake of drugs and its side effects observed as the causative factor in 6 (12%) patients; menstruation was the reason in 2 (4%). Majority of the āhāra observed as the triggering factors were kaphavarddhaka, vidāhikāraka as well as viṣṭambhakāraka. Raktamāci, vṛndākā, trapusa, nārikēla, kadaḷīphala, nimbu, nāraṅga, dadhi, madhurapadārtha, śīṭa-padārtha and śīṭajala are kaphavarddhaka. Amlīkā preparations, amlavarga dravyas, kuthithapadārtha cause vidāham; dadhi is absolutely an abhiṣyandi.

Raja:, dhūma may cause aggravation of vāta; change of ṛtu especially during the varṣa and śīṭa causes kapha and vāta varddhana. In some patients, onset of the ailment was observed during the summer season also. Some patients, when they are changing the place of residence or shifting for short stay to another place or when they are going to their working place, are found getting the attacks.

Daihika (physiological) factors i.e. kḷama (strain), advā (long walk), bhāradvahana (lifting of weights), vibanda (constipation), udāvarta (distension of abdomen), etc. cause the aggravation of vāta. Mānasika kāraṇas also is observed as one of the triggering factors of the disease, which cause vāta varddhana. Apart from these factors, it is also observed that in

some of the patients certain medicines cause the onset, whereas in some others, during menstruation.

Regarding the saṁprāpti, the following points were observed:

Mode of onset was acute in 16 (32%) patients and it was insidious in 32 (64%) patients. The time of onset was early morning in 16 (32%), evening in 4 (8%) and in 12 (24%) at night; the time of attack was after intake of food in 4 (8%) and uncertain in 14 (28%) patients. Frequency of attacks observed daily in 22 (44%), once in a week in 6 (12%), once in a fortnight in 2 (4%), once in a month in 4 (8%), once in six months in 2 (4%), once in a year in 6 (12%) and the frequency was uncertain in 8 (16%) increase

Conclusion

- Most of the patients (84%) observed food as the triggering factor.
- Among the foods, raktamāci, bhiṇḍitakī, vṛndākā, ambaṣṭakī, trapusa and nārikēla are found augment the problem.
- Intake of kadalīphala, āmra, nāraṅgaka, nimbu, madhurapadārtha and abhiṣyanda padārtha are also noted as the causative factors.
- Śītalapadārta, śītajala, preserved foods in śītīkaraṇayantra, kuthitāhāra, are also identified as triggering factors.
- Apatarpaṇam can also be a cause for the ailment.
- All the reported factors are mainly causes kapha vāta varddhana.
- Under the raja: group, dhūli (dust) and talcum powder are identified as the reasons.
- In dhūma group, traffic pollution is as important as perfumes.

- Kḷama, adhvā, bhāradhvahana under the daihika kāraṇas, and cinta (stress) in the mānasika kāraṇa can also be the triggering factors.
- Familial tendency was seen in 52% of the patients.
- With reference to bala saṁprāpti, saṁprāpti of vāyu is found acute in 32% and insidious in 64%, frequency of attacks observed daily in 44% of the patients. In kālasaṁprāpti, onset of prāta: kāla observed in maximum patients as 32%.

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PSYCHE (MANAS) – THE FACULTY OF THINKING AND ACTIVITY - AN AYURVEDIC VIEW

Rajni Chandre and K.H.H.V.S.S. Narasimha Murthy*

Abstract: The term mind is generally used as the English equivalent of the Sanskrit term manas. However, there are certain differences in the implications of these two terms. Manas has been very complex subject of discussion in India since the time of the Vēdas and the concept has developed through various stages, being differently explained in various philosophical schools. The scope of the concept of manas, which developed in the background of ancient Indian philosophy, is therefore slightly different from the modern concept of mind. This paper discusses the different aspects of manas such as its characters, qualities, objects, function, etc. through the ayurvedic perspective.

Introduction

Maintenance of positive health and curing of diseases are the main purposes of ayurveda. What the term health means is not mere absence of diseases but the well being of physical, physiological, psychological and social aspects of life. The relationship of body and mind is as old as mankind; and it had been recognized by both the primitive and middle-age civilizations by quoting “face is the index of mind”. So, looking at the face, one can assess the mind. The mind is responsible for all the cognitive, sensorial and motor activities of life. The mind further expresses its functions through the physical body; the feelings of different emotions can be seen on the face like happiness, sadness, hopelessness, etc. Everybody wants to be happy and cheerful rather than being sad and hopeless.

According to Carakasamhita, mind (manas) is one of the components of the life (āyu) in addition to the other three components i.e. physical body (śarīra), senses organs (indriya) and the soul (ātma)¹. Both the ancient and the modern schools of science and philosophy have been accepted the existence of mind. Manas is an important instrument in the process of perception. It plays an important role in the spiritual life also.

Caraka considers the manas transcending the indriyas (atīndriya) from the following regions:

1. Manas is not only the cause of knowledge of external world like other senses but it is also responsible for internal perception.
2. All the sense objects are grasped by the mind but mind is not grasped by the senses.
3. It controls all the other indriyas.

* Department of Kayachikitsa, Faculty of Ayurveda, IMS, BHU, Varanasi, UP, India.

In ayurveda, yoga and other allied literature, the term manas is generally used to indicate mind; and the synonyms for manas are citta, hṛdaya, svanta, hṛt and cētanam. The word manas is derived from the Sanskrit root 'man-jñānē' which means 'to think' and 'to analyze'. Hṛdaya or hṛt means 'the heart' which is the seat of the mind. Citta is one of the four internal means of perception (anta:karaṇa) along with mana, budhi and ahankāra. It is responsible for the phenomenon of perception.

The seat of manas

There are disputes in ayurvedic literature and in Indian philosophy regarding the seat of manas. It is widely admitted by Upaniṣads that the heart (hṛdaya) is the seat of manas. Aitarēya upaniṣads states that hṛdaya and manas are one and the same.

According to Caraka, manas is dependent on hṛdaya². Carakasāmhita considers the hṛdaya as the mūlam of manōvaha-srōtas³. It further says that the ten dhāmanis, manas, buddhi, cēтана and the pañcamahābhūtas are attached to hṛdaya⁴. Suśrutasaṁhita also regards hṛdaya as the seat of manas⁵. Kaśyapa indicates that all the indriyas together with manas derive from hṛdaya⁶. The Vēdānta states that manas is situated within the lotus of the heart. According to Bhēḷasaṁhita, manas is located between the siras (head) and the tālu (palate) which is the anatomical place of the mastiṣka or brain⁷. He further mentions that the manas is the controller of all indriyas.

In the context of psychological descriptions attributed to hṛdaya in ayurveda, it should be inferred that the brain itself is the seat but not the heart. Keeping the above facts in mind it can be concluded that heart is the seat of manas of the emotional aspect and the siras (brain) is

the seat of manas of intellectual and higher functions of manas.

Characters of manas

According to ayurveda, the characteristics of manas are: 1. unconscious (acētana), 2. substance (dravya), 3. oneness (ēkatva), 4. subtle (aṇutva), 5. material (pañcabhautika), 6. organ of perception and action (ubhayēndriya), 7. triguṇātmaka, 8. beyond sensorial perception (atīndriya) and 9. controller of indriya (adhishthāyaka).

Qualities of manas

Caraka describes aṇutva and ēkatva as the qualities of manas. Thus the manas is atomic (subtle) and one; it may appear more than one due to the diversity of its actions but it is one because it performs only one action at one time. Manas attaches from one sense to other very quickly because of its atomic nature.

Objects of manas

Caraka describes the objects of manas as (a) thinking (cintyam), (b) analysis (vicāryam), (c) reasoning (ūhyam), (d) meditation (dhyēya) and (e) determination (saṅkalpa)⁸. Apart from these objects, there are some other subtitles like happiness, miseries, etc., which constitute the objects of the manas. Happiness, etc. are the objects, which are perceivable by the manas without any aid from other sense faculties. Other objects are essentially included under the objects of sense faculties.

Functions of manas

Caraka classifies the manōkarmas (functions of mind) into four:

1. Regulation and guiding of indriyas through supervision called indriyābhinigraha.
2. Controlling of the self (itself) from not indulging in noxious and hostile activities called svasyanigraha.

3. Grasping of knowledge through conjecture called ūha.
4. Pondering over all facts called vicāra:.

According to Nyāya-vaiśeṣika, the manas is the internal organ through which the ‘self’ recollects, infers and dreams; in other words, the manas is the instrument for experiencing the “self”. It is responsible for recollection of colours, tastes, sounds, smells, touch, etc. Thus, the function of manas is to give a correct expression of the things as they are by affording the opportunity of being illuminated by the self.

Yōgasūtra of Patāñcali describes five types of cittavṛttis (mental modifications or fluctuations)⁹. They are 1) pramāṇa (right cognition); which includes valid states of perception, inference and belief in valid testimony, 2) viparyaya (error); which is the knowledge of the unreal as in doubt, 3) vikalpa (fiction); which is the existence of abstract imagination on the basis of language symbols, 4) nidra (deep sleep); which is the mental state that has for its objective substratum, the feeling of emptiness and 5) smṛti (memory) which means the recollection of the object through the impressions left behind by the previous experiences.

According to ayurvedic classics, these vṛttis produce five klēśas (afflictions), viz. 1. ignorance (avidya), 2. attachment (rāga), 3. aversion (dvēṣa), 4. ego (asmita) and 5. clinging to life (abhinivēśa).

Different levels of mind (cittabhūmi)

The five cittabhūmis that have been described by Vyāsabhāṣya of Patāñcali’s Yōgadarśana are: 1. craving (kṣipta) - in which the mind is greatly attached by the objects of senses, 2. forgetfulness (mūḍha) - in which there is a

tendency towards vice, ignorance, excessive sleep and the life, 3. distracted (vikṣipta) - which makes for virtue, knowledge, etc. 4. concentrated (ēkāgra) - where the mind is purged of impurities and there is prolonged concentration and 5. restrained (niruddha) - where all the mental functions cease and the mind is left in its original unmodified state of calmness and tranquility.

The last two states are found in mentally sound and healthy persons. The remaining three represent inferior mental states. The various psychiatric illnesses originate in mūḍha and kṣipta state of mind. The kṣipta, mūḍha, vikṣipta, ēkāgra and niruddha states represent the performance of rajas, tamas, rajas-tamas, satva and only satvaguṇa respectively.

Satyabuddhi or naistiki cikitsa

Caraka says “naistiki ya vinōpādham” which means the supreme treatment is that which is devoid of all allurements. Allurement is the greatest cause of miseries, and renunciation of all allurements eliminates all miseries. Absolute eradication of miseries is nothing but salvation. This stage can be attained only by virtue of the elimination of desires, which is also called as satya buddhi in which the universal jñāna and individual jñāna becomes one.

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Book Review

AYURVEDA - LIFE OF BALANCE

Author : Maya Tiwari
Published by : Motilal Banarsidas Pvt. Ltd.
Delhi.
Price : Rs. 595/-
No. of pages : 354
Ist Edition : 2005

K. Murali*

Ayurveda is defined by some texts as the science that distinguishes and explains the dravya (substances) with its guṇa (all associated properties) and bodily effect (karma) in relation to the healthy and unhealthy. The dravya includes substances that are used as both food and medicine. The knowledge of the bodily effect of these is practically essential for the maintenance of health and management of disease. Of these, information on food is of more value since adhering to congenial food prevents diseases. Vāgbhaṭa has given the properties of food materials than medicinal plants in his monumental work *Aṣṭāṅgahṛdaya*. Moreover, food itself is the medicine as treatment comprises of corrected food and lifestyle along with medicines (*auśadhānnavihārāṇām upayōga sukhāvaha:*). In the texts, the general arrangement of food materials consists of drava-dravya (fluid foods) which includes water, milk and dairy products, oils and alcohols; anna-varga (solid foods) with cereals, pulses, prepared foods, meat, fruits and other vegetables. As the civilization advances, use of raw food materials decreases. Variety of food preparation is in a rise. The cultural diversity broadens the field of prepared foods. This makes the references of classical texts some what irrelevant. But the basic approach is of much use, in interpreting today's foods. Ayurveda is in a grave necessity of a scientific analysis of present day foods.

The book under review, written by Maya Tiwari, is in fact a brave step in this direction. The author is a well recognized teacher of Ayurveda in United States. Her work is intended to be a complete guide to Ayurvedic nutrition, body types with appropriate universal recipes. The book was published in USA in 1995 and the Indian edition in 2005. She was a designer who really had the experience of healing her own cancer of the terminal stage. That had driven her to learn ayurveda from India, her own roots. And the book is a synthesis of her life's discoveries of twelve long years. We actually have a natural faculty to identify what is congenial to us which Maya calls cognitive memory. A yogic life style evokes this memory according her.

* Reader, Govt. Ayurveda College, Tripunithura-682 301 Kerala

The first two parts of this book give background knowledge. Part one is on the principles of ayurveda. Comparing the pañcakōśas with pañcabhūtas does not seem to be so appropriate. The gross body is annāmayakōśa which is pañcabhautik. Concept of pañcakōśas in vēdānta does not have any clinical significance; hence do not have any relevance in ayurveda. In the chapter of ayurvedic anatomy a description of dōśas, dhātus, malas and srōtas are available. Dōśas, quoting from a lecture, she mentions as devoid of physical manifestations. But according to ayurvedic concepts, dōśas are dravyas. They are the functional elements of the body manifested physically. It is from the manifestations that prakṛti (health, body constitution) and vikṛti (disease) are identified. In a book on food, the details of agni and its functions are never to be missed. Some ācāryas give the whole credit to agni in body nourishment (tatrāgnir hēturāhārāt nahyapakvāt rasādaya:). But instead Maya Tiwari adds nādis and carkas from the tantra. It may be fascinating for those are interested in such cults. For ayurveda, functionally there is nothing higher in the body than the three dōśas. The chapter on body types comprises of the descriptions on dēhaprakṛtis. There are simple questionnaires with which one easily recognize one's body type. But some factual errors have crept in. Vāta causes a restless mind but author has added disciplined also in the description. Vātaprakṛti is very talkative but can not be teacher or counselor. How somebody with restless mind calm other's mind? A pitta or kapha prakṛti may be scholar and genius. The vāta type is actually nāstika (atheist-not in agreement with the establishment). But in the book it is 'spiritually perceptive'. Many physicians often quotes the only negative part of the kapha type. It is that kapha type, often hides but maintain hatred once formed to anybody. Dreams also contribute a lot to the identification of the prakṛti.

In the chapter on psychospiritual nature of the body types, the psychological nature sexuality career seasonal and daily activities and appearance are analysed. Astrology is also considered and it may not be correlated to ayurvedic concepts in many occasions. The carkas deities and mantras related each prakṛti are elaborated.

The chapter of 'nature and tastes of each dōśa', contains the pharmacodynamic principles of ayurveda in relation to dōśas. In the examples of contradictory foods, dairy products with salt are mentioned, but in classical texts it is sour that is contradictory to milk products. In the food charts followed, vegetables, fruits, grains, legumes, nuts, seeds, dairy products, oils, sweeteners, herbs, spices, flavorings, condiments, seaweeds, brews, beverages, teas, congenial each body type are listed. Each variety is also classified into major minor and regressive groups. Those in major category are for every day use while that of minor category are for occasional use. The regressive group will have a negative impact on dōśas.

The influences of seasons on dōśas are also to be considered while selecting the foods for use. The texts refer six seasons as evident in North India and relate them to the dōśik states. But in the West it is four- spring, summer, autumn and winter. So the dōśik relation of these has to be reinterpreted. For definite conclusions, a study on the seasonal emergence of diseases and bodily changes during each season may be looked for indications. Maya Tiwari gives menus for different body types for various seasons with a time table for break fast, etc. How far it is practical for common man is an important matter.

In the chapter 'Food Sādhanas' contains the methods of processing and cooking of food stuff adding

some religious interpretation to each one of these. Of course, it is ideal to be involved in all the stages of food-preparation preferably from planting and harvesting. She prefers ancient utensils and methods. But a replacement in a modern society is a matter of doubt. A reminder on the hazards like microwaves, aluminum vessels, etc. are very relevant. But she accepts pressure cooking. The details of different types of grains, dhāls, oils and milk with its pre-cooking processing like sorting, cleaning, washing, soaking, hulling, kneading, etc. are given. The style of using food or the regimes associated with intake of food referred by ācāryas as 'upayōgavyavasta' is also detailed in this chapter. Instead of considering the stomach in 'one thirds', it is 'one fourths' (half of the stomach can be filled with food; one fourth with water and one fourth left empty).

The notion that ayurveda opposes the use of meat does not seem to be right. It is a food conceived from time immemorial to the present days. There are evidences that it was used even in Vedic period. The nutritional and medicinal values are well detailed in all the ayurvedic classics. But it is not necessary to use meat, for those who are not habituated to it due to many a reason. Why because in the matter of food and life style, it is ideal to follow what is habituated (yathāsātmyam āhāravihārō sēvyānām).

Part three 'Universal recipes for each body type' is actually the core of the book. More than three hundred health oriented vegetarian recipes from different parts of World, like India, Japan, Taiwan, etc. are listed here with an introduction on equipments tools cooking and cutting methods. The seasons on which the intake is ideal is indicated by icons representing each season. Among the idlis, included in the fifty two varieties of 'ground dhals and grains', wheat, cinnamon idli is some thing unique. Eleven breakfast preparations with grains are also given. Universal vegetable dishes includes fifty eight recipes. 'Bean dishes and dhāls' several types of sāmbar and rasams. The tridōṣa sāmbar may be prepared omitting chilli powder for pitta prakṛtis and using white potatoes for kapha prakṛtis. Rasam can be made with orange also. There are four types of kiccaṭis. Tofu dishes means preparations with soyabean. Seitan dishes are considered as substitute for meat. Eighteen salads are given. The number of soups described are twenty four. Details of more than fifty spices precede to the section on masālas and condiments. Zuchini-chutney and Plum-chutney are the attractions among the ten chutneys. Beverages include seven types of teas.

As an after word, there is a section on universal values which includes love compassion truth devotion and silence. Appendix refers the addresses of information resources; pañcakarma centres; suppliers of herbs and kitchen equipments. Absence of botanical names and vernacular names of vegetables makes their identity difficult.

Even though there are some factual errors here and there, this book contributes to the globalization of ayurveda, but in different way. The term globalization often connotes commerce. The dissemination of knowledge without draining the resources from India is the ideal globalization. The foods and herbs available in each country may be analysed in terms of ayurvedic principles and to be made into practice. By using non-Indian materials author has invented dishes corresponding to the Indian ones. Also she has identified ideal recipes from different countries. This is the perception of ācāryas also. The food and medicine from ones own nativity is recommended as ideal by Suśruta.

ANTHELMINTIC EVALUATION OF A COMPOSITE HERBAL EXTRACT FORMULATION

R.A. Vasulakar*, V.P. Vadlamudi** and A.A. Deshmukh*

Abstract: The hot aqueous extracts of stem bark of *Holarrhena antidysenterica* (kurci), seeds of *Vernonia anthelmintica* (kali zeera) and fruits of *Embelia ribes* (vayvidang) were evaluated for anthelmintic activity *in vitro* using *Ascaridia galli* worms. The median paralytic (PC₅₀) and median lethal (LC₅₀) concentrations for the extracts of *H. antidysenterica*, *V. anthelmintica* and *E. ribes* were found as 44.00, 60.50, and 24.00 and 39.50, 68.75 and 95.63 mg/ml, respectively. The three plant extracts were mixed in pre-fixed proportions i.e. taking the quantities equivalent to 1.562 to 100 percent of their respective LC₅₀ values to obtain a composite herbal extract formulation, which was also evaluated against the worm. The PC₅₀ and LC₅₀ values of the composite extract were 18.08 and 14.54 mg/ml respectively, indicating anthelmintic synergism between the herbal extracts while in combination.

Introduction

Chronic gastrointestinal helminthiasis is one of the most common and economically important disease entities of livestock including large as well as small ruminants and poultry, impeding profitable livestock production. The traditional and time-tested treatment of nematode parasitism in livestock is use of chemical anti-parasitic drugs 'anthelmintics'. However, the extensive and indiscriminate use of these chemicals during the last three decades has resulted in widespread anthelmintic resistance. The development of a new anthelmintic chemical, with novel mode of action, is time consuming and cost-prohibitive. Hence, there

has been a growing awareness globally to search for suitable alternatives for sustainable control of parasitic gastroenteritis in livestock.

The vast and voluminous literature on Indian medicinal plants lists a number of plants with anthelmintic properties. There have also been innumerable reports of studies on anthelmintic efficacy of Indian medicinal plants. However, almost all the earlier studies were based on *in vitro* anthelmintic evaluation using one or more extracts of the plants singly. It is important that an anthelmintic formulation based on indigenous medicinal plants is prepared and evaluated for clinical use for the control of worm infestation in livestock.

* Dept. of Pharmacology & Toxicology, PG Inst. of Veterinary & Animal Sciences, GIVAS, Akola-444 104

** Dept. of Pharmacology & Toxicology, College of Veterinary Science & AH, Anjora Durg-491 001

Materials and methods

Three popular indigenous medicinal plants namely *Holarrhena antidysenterica* (kurci), *Vernonia anthelmintica* (kāli zeera) and *Embelia ribes* (vayviḍaṅg) recognized to possess anthelmintic efficacy were selected for the present investigation. The dried stem bark of *H. antidysenterica*, seeds of *V. anthelmintica* and fruits of *E. ribes* were processed to obtain hot aqueous extracts. The anthelmintic activity of the three extracts was first studied independently and then the three extracts were mixed as a composite herbal formulation and evaluated for anthelmintic activity. The anthelmintic activity of the individual and combined extracts was evaluated *in vitro* (Sharma and Sisodia, 1976) using the poultry roundworm *Ascaridia galli* collected from desi poultry birds from a private slaughterhouse. The worms were exposed to graded concentrations (5, 10, 25, 50, 75 and 100 mg/ml) of the plant extracts in Tyrode solution to record their median paralytic (PC₅₀) and median lethal (LC₅₀) concentrations by Karber's arithematic method (Turner, 1965) by noting the number of immobile and dead worms at 6 and 10 hr of post-exposure respectively. A composite extract was formulated by mixing the three plant

extracts in pre-fixed proportions i.e. taking the quantities (mg/ml in Tyrode solution) equivalent to 1.562, 3.125, 6.25, 12.5, 25, 50 and 100 per cent of their LC₅₀ values. The composite extract was also tested against the worms to obtain the PC₅₀ and LC₅₀ values as above.

Results and discussion

The PC₅₀ and LC₅₀ values (Table 1) of hot aqueous extracts of *H. antidysenterica*, *V. anthelmintica* and *E. ribes* were 44.00, 60.50, 24.00 and 39.50 and 68.75 and 95.63 mg/ml, respectively, indicating the anthelmintic potency of the three extracts in the order of *V. anthelmintica* > *H. antidysenterica* > *E. ribes*. The present study confirms the earlier reports of anthelmintic efficacy of the three plant materials (Garg and Mehta, 1958; Gupta *et al.*, 1976; Jawale *et al.*, 2000; Wanjari *et al.*, 2000).

The ratio of LC₅₀ and PC₅₀ for *H. antidysenterica* and *E. ribes* was almost similar (1.37 to 1.40) and that of *V. anthelmintica* was 1.64, suggesting that a slightly higher concentration of the extract in respect to *V. anthelmintica* was required to cause death of the worms as against paralysis in comparison to the respective concentrations of the other two plant extracts. The PC₅₀ and LC₅₀ values

TABLE 1
The median paralysis and lethal concentrations of herbal extracts against *Ascaridia galli* worm

Sl. No	Plant extract	Modern Paralysis concentration (PC ₅₀)	Modern Lethal concentration (PC ₅₀)	LC ₅₀ /PC ₅₀
1.	<i>Holarrhena antidysenterica</i> - bark	44.00	60.50	1.37
2.	<i>Vernonia anthelmintica</i> - seed	24.00	39.50	1.64
3.	<i>Embelia ribes</i> - fruits	68.75	95.63	1.40
4.	Composite extract	18.08	14.54	1.24

for the composite herbal extract were found out as 18.08 and 14.54 mg/ml, respectively. From the data it is evident that both the median concentrations were much lesser for the composite extract than those of the respective values of the three plants extracts, when tested individually. From the ratios of LC_{50}/PC_{50} it is also apparent that the latter caused paralysis and death of the worms with lesser variation/margin in the concentration (ratio = 1.24) as compared the ratios of the individual extracts (1.37 to 1.64). This observation also indicated higher anthelmintic efficacy of the composite herbal extract than the individual plant extracts. From the present investigation it is concluded that the plants *H. antidyserterica*, *V. anthelmintica* and *E. ribes* have synergistic anthelmintic activity.

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TRIDOSHA THEORY

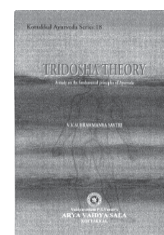
A Study on the Fundamental Principles of Ayurveda

Dr. V.V. Subrahmanya Sastri

The theory of *tridosha* forms the foundation of ayurveda. In this text the learned author scientifically explains the physiology of human body through the principles of *vata*, *pitta* and *kapha* keeping in view some of the processes as explained by modern science without detriment to the main concept postulated in ayurveda.

The author, late Sri. V.V. Subrahmanya Sastri, is well known in the world of ayurveda. He was Professor of Ayurveda, Deputy Director and Research Officer under CCRAS. He was also a successful practitioner, an erudite scholar and an eminent pundit deeply immersed in the study of classical texts.

Dr. P.K. Warriar in his preface to the new edition



THE DIABETIC AND HIS DIET

Gaurish Kumar Gupta and Ajay Kumar Sharma*

Abstract: In the management of diabetics, the role of diet is more important than insulin and oral hypoglycemic drugs. A properly adjusted diet is the best oral hypoglycemic therapy. This paper elaborately discusses the diet schedule of the diabetics in respect of their physical activity. The importance of education, aim of diet therapy, etc. are also dealt with.

Introduction

Many diseases can be arrested following a healthy way of life and diet. In no disease diet forms the sheet anchor of the treatment as in the case of Diabetes Mellitus. Clinically diabetics are divided into two from the very time of Caraka and Susruta viz. the lean and the obese; and a nourishing diet is recommended to the leans and weight reducing diet to the obese. The expert committee of WHO in its second report (1980) divides diabetes mellitus into two i.e. i.) Type-I - Insulin dependent diabetes mellitus (IDDM) and ii.) Type II - non-insulin dependent diabetes mellitus (NIDDM). Frequent dietary review is essential and helpful as far as a diabetic is concerned.

Diet planning

There is no a single diet or a common meal plan recommended for all diabetics. It is the total food requirement for maintenance of optimum body weight of the individual and distribution of the calories that counts more

than the mere consideration of a single food component especially carbohydrates.

For insulin dependent diabetics, adequate calories for normal growth, development and maturity are needed. Meals must be taken on regular schedule depending on the peak action of insulin administered and the exercise of the individual. Constant revision of diet is needed till the patient cross their adolescence. Normalization of glucose and lipid metabolism is more essential to decrease macro and microvascular complications. Starving is hazardous for insulin dependent diabetics.

For an obese non-insulin diabetic, diet with low calories is advised; otherwise, the diet prescribed should be in accordance with his height, age and constitution. In other words, diet planning is the primary treatment of an adult, non-insulin dependent diabetic, which is aimed mainly to bring the weight to the ideal norm corresponding with his height, age and constitution. Dietary measures are essential to

*P.G. Department of Kayachikitsa, NIA, Jaipur – 302 002

control blood glucose level and thereby minimize the risk of hypoglycemia in those treated with insulin.

Calculation of diet in non-insulin dependent diabetics:

Activity	Calories required per kg/day		
	Overweight	Normal	Underweight
Sedentary	20-25	30	35
Moderate	30	35	40
Marked	35	40	45-50

Age: - In insulin-dependent diabetic children, 1000 calories are considered as the base line and then 100 calories for girls and 125 calories for boys are to be added for every year up to the age of 12 years. Thereafter, diet is calculated at 50 calories per kg as ideal body weight in children and adolescents, which is essential to support the linear growth. For adult diabetic, 30 calories per kg is considered as the ideal body weight for males and 25 calories per kg for females, which is adequate up to the age of 45. As there is reduced basal metabolic rate and physical activity, it is desirable to reduce the calorie intake by 5% per decade for those of between the ages 35 and 55; and by 8% per decade between the ages of 55 and 75. In those who are above 75 years, the calorie intake has to be reduced by 10% per decade.

Sex:- Generally, women need more calories during pregnancy and lactation to maintain growth of the foetus and cope up with the strain of pregnancy and nourishment of the child after birth.

Activity: 15% additional calories over the basal calories are necessary with the average physical activity; and with heavy manual work 25% to 50% increase is necessary.

Education of the diabetic

Diet is the best oral hypoglycemic therapy and

TABLE 1

Diet schedule of the diabetic doing less work

Two glasses of lukewarm water should be taken prior to brush the teeth. Then one cup of tea made by herbal drugs + 60 ml milk (45 calories) + one soyabean biscuit (15 calories)		Calorie
BREAKFAST:		
Pappaya (300 g)		96
A cup of milk (150ml)		90
LUNCH at 11.00 - 1.00 pm:		
One chapatti (30 g)		105
Rice (70 g)		70
Leafy vegetable (200 g)		90
Curd (100 g)		60
Ghee or oil (5 g)		45
Salad (200 g)		80
Seedling grains (35 g)		56
10 gm of methi powder should be taken ten minutes earlier to lunch and dinner.		
At 2.30 p.m. (according to season)		
Orange (150 g) or		72
Tomato (200 g) or		40
Guava (150 g) or		77
Apple (150 g) or		90
Pappaya (200 g)		64
At 4.30 p.m.		
A cup of tea made by herbal drugs, or		45-50
Soup or curd (75 g)		40-50
Butter milk (200 g) or		45-50
Coconut water (200 ml)		45-50
[Sugar nil powder of bitter gourd, jamun seed, vilva, neem, tulsi and chameli leaf 5g should be taken before taking these]		
DINNER at 7.00 - 8.00 pm:		
One chapatti (30 g)		105
Vegetable (200 g)		80
Raita (100 g)		60
Ghee or oil (5 g)		45
At 10.00 p.m.		
A cup of milk (150 ml)		90

hence the diabetic needs to make aware of the necessity of an adjusted diet. The rationale behind of a diet planning should not only aimed at chemical control by keeping the blood sugar

TABLE 2
Diet schedule of the diabetic
doing normal physical work

	Calorie
A cup of tea made by herbal drugs + 60 ml milk	45
One soyabean biscuit	15
BREAKFAST (8.00 - 9.00 a.m.)	
Pappaya (300 g)	96
Milk (200 ml)	120
LUNCH at 11.00 - 1.00 pm:	
Two chapattis (each 30 g)	210
Rice (70 g)	70
Dal (15 g)	52
Leafy vegetable (220 g)	125
Salad (250 g)	100
Curd (100 g)	60
Ghee or oil (5 g)	45
At 3.00 p.m.	
Fruits (200 g)	70
At 5.00 p.m.	
Seedling grains (40 g)	90
Soup or butter milk (200 ml)	50
DINNER at 7.00 - 8.00 pm:	
One chapati (30 g)	105
Vegetable (200 g)	80
Raita (100 g)	60
Ghee or oil (5 g)	45
At 10.00 p.m.	
A cup of milk (150 ml)	90

as normal as possible but also the maintenance of the sense of vigour and vitality and thus, maintaining the ideal body weight of the patient. To get the best result of the diet therapy, necessary instructions should be given to the patients such as: what to eat and what not; what quantity to eat i.e. the desirable calories and other food components; and when to eat i.e. periodicity, the best distribution of food both in quantum and also in relation to action of the drugs and exercise.

Diet therapy

The main aim of a dietary treatment is to keep

the diabetic as an active member of the society, keep his metabolism balanced and to maintain his body weight. The diet, therefore, must supply:

- Appropriate calories and carbohydrate at regular intervals to meet the metabolic needs of the body with least strain, optimize control of blood glucose levels and minimize risk of hypoglycemia.
- Satisfy special considerations such as i) growth and pregnancy, ii) service conditions iii) physical exercise iv) traveling and v) complications - both acute and chronic due to diabetes or other disease, if present.
- Besides vitamins and minerals, provide adequate calories and volume for satiety.
- Keep the diabetic fit and active so as to reduce the risk of long-term complications and prevent them as far as possible.
- Help the diabetic to maintain optimum body weight for height and constitution.

Dietary regimen

The diet planning should be in accordance with physical activity of the diabetics. Those who are doing less physical work should keep the diet regimen as detailed in table 1. The diabetic doing normal physical exercise should take diet as described in the table 2. Those who are doing marked physical work should keep the diet as detailed in table 3; and the calorific value of daily diet is shown in table 4.

Food items like sugar, jam, honey, chocolates, glucose drinks, sugar products, cakes, sweets, biscuits, alcoholic beverages, grape juice, mango shake, etc. are to be strictly excluded from the diet schedule of a diabetic.

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TABLE 3
Diet schedule of the diabetic
doing marked physical work

	Calorie
Two glasses of lukewarm water should be taken early in the morning prior to brush the teeth.	
<i>At 6.00 a.m.</i>	
A cup of herbal tea + milk (20 ml)	20
Two Soyabean biscuits	30
BREAKFAST:	
Pappaya (200 g)	64
A glass of milk (250ml)	150
Seedling moong/chana (40 g)	90
LUNCH at 11.00 - 1.00 pm:	
Two chapattis (each 35 g)	245
Rice (70 g)	70
Dal (20 g)	70
Curd (100 g)	60
Salad (250 g)	100
Leafy vegetable (200 g)	90
Ghee or oil (5 g)	45
<i>At 2.30 - 3.00 p.m.</i>	
Fruits (200 g)	73
<i>At 5.00 p.m.</i>	
Seedling grains (40 g)	90
DINNER at 7.00 - 8.00 pm:	
Two chapattis (each 30 g)	210
Soup or butter milk (200 ml)	50
Vegetable (200 g)	80
Raita (125 g)	95
Ghee or oil (5 g)	45
<i>At 10.00 p.m.</i>	
A cup of milk (200 ml)	120

TABLE 4
The calorific value of daily diet

	Calorie
One chapatti (40 g)	140
Rice (100 g)	100
Butter (10 g)	70
Fruits (200 g)	100
Milk (150 ml)	100
One boiled egg (50 g)	75
One paratha (85 g)	240
Vegetable (90 g)	90
Curd (100 g)	70
Ghee or oil (5 g)	45
Two Idlis (90 g)	120
A cup of cofee (150 ml)	70
Sambar 1 katori (140 g)	100
One omlate (70 g)	175
One masaladosa (150 g)	380
Seedling grain (50 g)	111
Butter milk one glass	30
Dal (40 g)	130
Tomato salad (50 g)	10
Fish (100 g)	100
Six Pooris (75 g)	300
Potato sabji (85g)	100
Tea (150 ml)	20
Coffee (40 ml)	70
Suji Halva (100g)	340
Carrot halwa (100g)	320
Ice cream (150g)	250
Rice keer (130g)	320
Honey (10g)	32
Sugar (10g)	40
Chana (Parched (30g)	100
Aloo Chuda (100 g)	180
Coca Cola (218 ml)	92

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