Health Series

Traditional Family Medicine

Khas, Kesar, Nagakesar, Khaskhas

HEALTH SERIES :
TRADITIONAL FAMILY MEDICINE

Khas, Kesar, Nagakesar and Khaskhas

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The information contained in these pages has been culled from various sources. This information is solely meant to create an interest about the wondrous qualities of our medicinal plants. On no account should this be utilised in a lay manner. Help of a trained physician is necessary.

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INTRODUCTION

The term Khas or Cuscus grass in English refers to an aromatic grass botanically known as *Vetiveria zizanoides* familiar all over as the fragrant roots employed in making hand fans or ceiling fans in old type travellers' bungalows. Kesar is the famous saffron or *Crocus sativus* from Kashmir. Naga kesar is a densely fragrant flower called Cobra's Saffron in English or *Mesua ferrea* in botany. All of these three plants are aromatic or sweet smelling plants that are also of great medicinal value in their own ways. The term Khas khas refers to the well known poppy plant or *Papaver somniferum* yielding opium, the great narcotic or the intoxicating plant drug which also has remarkable value and importance in medicine.

The fact that plants are natural and exquisite factories that manufacture unique organic chemical substances of far reaching and unparalleled significance in medicine and science is most beautifully illustrated by such aromatic and the narcotic plants as above. For, these unusual substances because of which they gain their importance are produced by these plants as but normal and routine products of their biosythesis or, metabolism. In many cases moreover their own role in the life of the plants concerned is not at all clear although there is no doubt whatsoever regarding the value of these substances to man.

It is wholly the ingenuity of man that has discovered these remarkable substances that are widely scattered in various and quite often, totally unrelated plants and to have utilised them to his own benefit. Very usually these substances are produced in but little qualities and often, in but some stages only of these plants so that their gathering and commercial cultivation offer problems that need to be carefully considered and overcome.

In discussing the aromatic and narcotic plants in some detail below we naturally go a little beyond the four plants selected here. For, the active principles concerned are widely scattered and variously utilised.

Aromatic Plants

The oil of the aromatic plants are also known as essential or volatile oils distinguishable from the fatty acids (for example, coconut oil) in that they evaporate or volatilise in contact with air and have a pleasant taste and strong aromatic odour. They can be easily removed from the plant without any change. Chemically they are very complex. All distinctly aromatic plants do contain characteristic essential oils. These form about 60 families, a few important families being Lauraceae (eg. camphor), Myrtaceae (egs. Eucalyptus and Clove), Umbelliferae (egs. tulasi, origanum, patchouli - discussed separately as aromatic herbs in this series) and Composite (egs. *Artimesia* or wormwood, *Carthamus* or safflower and Chrysanthemums). The amount of the oil secreted is often infinitesmally scanty and sometimes reach to 1 to 2 per cent. Any organ of the plant may be the place of such oil secretion; it may be for instance, flowers (jasmine), fruits (limes, oranges), leaves (*pudina, tulasi*), root (ginger and turmeric), wood (*deodaru*), flower buds (clove), seeds (cardamum) and also many resinous exudations (oil of turpentine).

These oils are used for a varied type of purposes. For instance, clove oil from the well known spice is used for flavouring food stuff, in perfumery, medicine, in microscopic observations as a clearing agent and as a source of synthetic vanilla scent. Quite frequently as in this clove oil, many oils are used for flavouring and also for medicine with

equal frequency.

A very valuable use of many essential oils is in making perfumes and the industry of perfumery. History of perfumes is almost a history of man's civilisation, for, they have been known to occupy an important role in all cultural and aesthetic life ever since the beginnings of his recorded story. Their role had become so specialised in the life of the cultured ancient Romans and the Greeks that, specially among the latter, each part of the body had its own preferential perfume. It is well known in European History that the regal Catherine de' Medice knew as much about perfumes as she did about poisons, both being specialised arts of court life. At the times of Queen Elizabeth a gift of rare perfumes was a sure way to win the royal favour and in the Court of Louis XIV at Versailles, each day in the year had a particular perfume whose preparation was supervised by the emperor himself. During those days perfumes were of great aesthetic as well as hygienic value serving as they did as antiseptics and deodorants to mask the offensive smells when personal hygiene was not of a great concern. The *attars* of the Moghul Courts are also very famous probably for the same reasons.

Perfumes are even now in great demand. Natural perfumes are always more preferred in spite of there being many synthetic materials now, since they are more stable and more long lasting. The most valuable perfumes however are those that are

carefully planned combinations of several essential oils. A well known perfume frangipani for instance contains the American red plumeria, the Indian Sandal Wood, the sage, neroli (from the orange flowers), orris root and also musk. And, one of the formulas for Eau de Cologne dating from 1709 needs neroli, rosemary, lemon and bergamot-all dissolved in pure alcohol and kept for aging for a varying period. Perfume blending is an expert, exacting and costly art.

Oil of vetiver is an essential oil obtained from the roots and rhizomes of the khuskhus plant (*Vetiveria zizanioides*), a native of India originally and much referred in classical Sanskrit literature as *usheera*. But it is now cultivated in several countries of the world throughout the tropics and the subtropics and constitutes one of the more famous perfumery materials of the world market.

Narcotic Plants

These are totally different from the aromatic or the sweet smelling plants. They do not have any unusual smell but contain very unusual chemicals, the narcotics which are alkaloids that are of great value in medicine since they bring about a relief from pain, or a quietening of anxiety and fears or they cause sleep and in addition, they are also poisonous and very much habit-forming leading to addiction and all the possible consequences thereof. Using them should always be accompanied with great caution and judiciousness.

The importance of the narcotics springs from the fact that they directly act on the Central Nervous System in a varied manner. Cocaine (from an American plant *Erithroxylon coca*) and opium for example, act as sedatives on mental activity in general, bringing about a state of physical and mental comfort. Such an effect is also accompanied with a diminution and even suspension of emotional response and perceptive reactions as well as, often, a complete suppression of even conciousness. Cannabis (hemp, *ganza*), peyote (a Mexican Cactus *Lophophora williamsonii*), fly agaric or the poisonous mushroom (*Amanita muscaria*), Caapi or the lianas of the Brazilian forests of the Amazon (*Banisteriopsis caapi*) and the narcotics of the Brinjal family of Solanceae (e.g. *Datura* and the black henbane or *Hyosciamus major*) - all of these generate a cerebral excitation and simultaneously bring about, hallucinations, visions and illusions. This also results in intoxication accompanied or followed by many symptoms such as unconsciousness, lack of inhibition, irregular speech and the like-all, very much like what happens among the insane. Kavakava, almost universal through Oceania or the Pacific Islands has a totally different effect. This is from a species *Piper methysticum*, a pepper like plant and a native of Fizi islands but now grown everywhere in South Seas. The cleaned roots are cut up and chewed until they are fine and fibrous and then placed in a bowl with water and allowed to ferment and then used as a beverage. This acts as a sedative, a

soporific and a hypnotic bringing about pleasant dreams and sensations. Excessive use however may produce skin diseases and weaken the eye sight. This is however used regularly along with festivals and religious practices or as a token of good will or even as a daily beverage among the islanders.

It is useful to have some idea of such drugs that depress the central nervous system in diverse ways. Many of them are extremely valuable, often life saving drugs when used with care and full knowledge. It should also be noted that nowadays there are many synthetic drugs also that bring about such actions and are actually employed in medical practices. The following are some of the technical terms worth knowing here. *Narcotic* is a drug that induces drowsiness, sleep or stupor (a state of dazedness or one of helpless amazement) and accompanied specially with *analgesia* or relief from pain. *Hypontic* is a drug that induces sleep almost compulsively. *Sedative* is a drug that calms down or soothes without inducing sleep though it may also cause a certain amount of sleepiness. *Anaesthetic* is a drug that induces absence of sensation; this may be local or general. *Tranquiliser* is a drug that will quieten down without significantly impairing consciousness. A purely ideal tranquiliser (though such a one rarely exists) is a drug that would assuage down pathological (i.e. almost disease causing) anxiety and nervous tension without altering any other functioning of the brain. Most importantly this would also

suppress mania (or violent insanity) and also psychotic over-activity. *Neuroleptic* drugs are those drugs that bring about these desirable psychological effects more impressively. *Psychotropic* drugs are those that alter mental functionings. Finally, *anticonvulsant* drugs are those that prevent and suppress convulsions or uncontrolled gesticulations-of an epileptic patient, for example.

In the light of such an analytical grasp of the effects of the drugs on some of the important activities of the mind it will be revealing to inquire if Ayurveda offers such a categorisation of the Indian Medicinal plants and if so what are atleast some of these important plants that have already occupied significant places in the Ayurvedic literature.

Such a list of a few selected plants is presented below under the several categories arranged alphabetically, giving the Sanskrit name for the clinical condition concerned also wherever possible. Sanskrit and Hindi names are also given for the plants listed.

Apoplexy (*sanna* or *sannyasa*) a state of Coma - a sudden loss of sensation and motion generally as a result of haemorrhage (i.e. bleeding) in the brain or thrombosis (a clot formation in the blood capillaris of the brain).

Ayurvedic plants recommended for this condition are: camphor or *karpoora*, *Croton tiglium* (*naepala* or *jayapala*; *jamalgota*), *Garcinia pictoria*,

(*tapinja, tamal* - the gum resin), *Helleborus niger* (*katurohini; khorasani katuki* - root of the plant formerly employed in apoplexy, epilepsy, mania, and melancholia, but now prescribed under great care as it is a narcotic poison if given in large doses) and *Sinapis juncea* (*rajasarshapa*; black mustard).

Brain affections (cerebral congestion). Garcinia pictoria, Desmodium gangeticum (shalaparni, sariwan). Herpestis monniera (brahmi) and *Achyranthes aspera (apamarga; chirchira)* - *payasam* or *kheer* of the seeds in milk is a good remedy for a diseased brain).

For loss of memory *Withania somnifera* (*ashwagandha*). Root is used in doses of 30 grains in nervous exhaustion, brain fag and loss of memory).

Cachexia (depraved habit of mind). The plants are: *Strychnos nux vomica* (*visha mushti;* poison nut, *jahar* in Hindi; a notable feature is the sharpening of sensory functions and specially the eye sight); but the plant, specially the seed, is highly poisonous, often leading to death.

Convulsions (*akshepaka, apasmara*). The plant drugs are as follows: for convulsion in the infants, onion and garlic. Other plants are *Cassia occidentalis* (*kasamarda*, a decoction of the leaves, roots and flower is highly praised in hysteria to relieve the convulsions and is also useful for nervous women), *Ferula asafoetida* (*hing*; a

valuable remedy for hysteria and nervous disorders of women and children and also of the spasmodic affections of the bowels, specially when connected with hysteria), *Ruta graveolens* (*Sadapaha*; Garden Rue; *sadab* in Hindi, juice of the plant is antispasmodic in children but a narcotic poison in large doses; it is also useful in some kinds of hysteria and in infantile convulsions), *Gynandropsis pentaphylla* (*arkapushpaka; hurhur* in Hindi; seeds are antispasmodic; they are useful in convulsive affections), *Nardostachys jatamansi* (*jatamansi*; infusions from fresh roots is useful in hystero epilepsy and similar nervous and convulsive ailments) and *Sinapis juncea*.

Delirium (a disorder of the brain, often due to over alcohol absorption and characterised by convulsive or trembling symptoms; *vibhrama*). Some of the plants suggested are: camphor, *Lagenaria vulgaris* (*katu tumbi*; Bitter bottle gourd; bitter *luaki*; the pulp of the fruit is applied over shaved head as a cooling application in delirium; the juice of the fruit boiled with a sweet oil is also used for application for the head in delirium), *Michelia champaka* (champak flowers. A fragrant perfume similar to the famous ilang or ylang ylang of China is prepared from the flowers and constitutes one of the most esteemed perfumes of India and the orient. This is very good in head-ache. Leave anointed with ghee and with cumin seeds or *jeera* sprinkled all over are placed round the head to relieve puerperal or after child birth mania, delirium and maniacal or wild and insane

excitement), *Myristica fragrans* (Nutmeg; half a drachm of its powder can be safely given in delirium tremens and insomnia or loss of sleep, where the other two drugs commonly employed for the purpose viz opium is contraindicated and the chloral hydrate has failed), poppy or *Papaver somniferum*, *Sinapis juncea* and *Zizyphus jujuba* (*badara; baer* in Hindi; the root decoction is useful in fever and delirium).

Dipsomania (a morbid craving for alcoholic stimulants, *unmada*). The plants advised are: Coriander (oil is useful in neuralgia, or nervous pain; also considered to lessen the intoxicating effects of spirituous liquors), *Carum copticum* or *ajwan*.

Epilepsy (a chronic functional brain disorder accompanied by recurring attacks of sudden insensibility or impairment of consciousness along with peculiar *convulsive seizure; apasmara*). For this, a very long list of plants are suggested. Only a few of them are given here: *Acorus calamus* (*vacha*), *Adhatoda vasica* (*vasaka*), Onion, *Saussurea lapaa* (*pushkara mul*, costus root or *kust* in Hindi; root is smoked in India and China as a substitute for opium), *Benencasa cerifera* (*kushmanda*, Ashgourd, White or *golkaddu* or *petha*. Fresh juice of the fruit is useful with or without liquorice or *mulethi* root in insanity, epilepsy and other nervous disorder), camphor, datura, brahmi, *Nardostachy jatamansi*, *Smilax* or *sarsaparila* and so on.

Fainting (*moorcha*): The plants suggested are: onion and garlic, drumstick and ginger.

Hemiplegia (*parshva vadha*; partial paralysis). The suggested plants are *ajmoda* or *Apium graveolens*, *Asparagus racemosus* (*shatavari*). *Atalantia monophylla* (wild lime; leaf juice is a liniment in partial paralysis); *Ichnocarpus frutescens* (*sariva*), *Illicium verum* (star Anise; *anasphal* in Hindi; forms an ingredient in a decoction meant for hemiplegia and facial paralysis), *Orchis mascula* (*sala misri*; this is much prescribed for hemiplegia and paralytic affections).

Hysteria (*apatantraka*): For this also there occurs a very long list of plants. Only a few of them are: *apamarga* (*Achyranthes aspera*), *vacha*, onion and garlic, *camphor*, *ajowan*, *hing*, drumstick and ginger.

Insanity (*unmada*): Some of the plants suggested are: *vacha*, *bilva* (*Aegle marmelos*) ash gourd, *jamalagota*, *datura*, *brahmi*, *Rauwoolfia serpentina* and giner.

Insomnia (*nidranasha*): For this also a long list of plants is suggested. A few of them are: onion and garlic, *punarnava* (*Boerhaavia diffusa*), camphor, cannabis or hemp, nut meg, poppy, strychnos nut and *ashwagandha*.

Mania (violent madness. *unmada*): The suggested plants are: *Acalypha indica* (*arittamanjari*; *kuppu* in Hindi. In acute mania, macerate 3 ounces of fresh leaves, stalks and

flowers in a pint of wine in a closed jar for several days, strain and use), hemp or *Cannabis sativa*, datura, *Helleborus niger* (*katu rohini*) and *Hyoscyamus niger* (*parasika yava*, the famous Henbane poison).

Melancholia (oppressive sadness): The suggested plants are: *kesar* or *Crocus sativus*, *Ipomea turpethum* (*trivrit* or *nisholh* in Hindi for many mental troubles) and *Trichoranthes dioica* (wild *patola*; the Bitter Snake gourd).

There is no doubt that a study of such plants and many others that have a direct impact on mental states and can therefore be utilised for rectifications of any errors, dysfunction and disorders therein is always very fascinating because of its scientific value as well as medicinal significance. We however restrict here with only one of them viz. *Papaver somniferum* or opium on which a famous modern physician Thomas Sydenham exclaims as follows: "Among the remedies which it has pleased Almighty God to give to man to relieve his sufferings, none is so universal and so efficacious as opium".

We shall however first discuss the three aromatic plants viz. cuscus grass, *kesar* or saffron and *naga kesar* and then come to the narcotic opium or *khas khas*.

A. CUSCUS GRASS OR KHAS, VETIVER

Vetiver is a name taken directly from its equivalent in Tamil *vettiver*, which literally means a root that

is hatcheted up - a term that picturesquely describes the extensive rootsystem of this grass that is so irregular and messed up that it really looks as if it is just coarsely cut up with a small hand axe. The botanical name of the plant is *Vetiveria zizanioides* Nash and the plant belongs to the family of grasses. Oil of vetiver is of commercial importance in perfumery and is obtained from the roots and the rhizomes of this plant. These roots are very sweet scented and most importantly they retain this smell and fragrance even when they are dry and continue to do so for a long time. The fragrance gets enlivened by a sprinkling of cool water so that a cool whiff of breeze that is aromatic as well, is obtained thereby. It is this property that makes the dense matty roots of the plant as the most suitable, if not, the ideal material for making mats, fans, screens, awnings, sunshades, baskets, satchel bags and even pillows. The leaves do not have any aroma. This is a native of India but now actively cultivated in many places including America; many gardeners, specially the French would like to grow this plant in their fields. Very commonly it readily escapes from cultivated fields to nearby areas and gets well established there. On distillation the root yields the essential oil which is very much like the citronella or the lemon grass oil that is used preferentially for high grade perfumes, soaps and also in medicine. Besides, the oil of vetiver is one of the finest fixatives.

This is known as *usheera* and Ayurvedically classed under the group of the aromatic plants

that have medicinal value known as *karpuradi varga* or the camphor class. A few of the other plants of this class as mentioned in the classical Texts are: chandana (*Santalum* album), *deodaru* (*Cedrus deodara*), *tagara* (*Valeriana wallichii*), *guggulu* (*Commiphora mukul*), *lavanga* or clove, *ela* cardamum, *dalchini* (*Cinnamomum zeylanicoum*), *mustaka* (*Cyperus rotundus* - another grass), *kumkuma* or *kesar* (*Crocus sativus*) and so on.

The importance of vetiver is so well realised now that there are active programmes in our modern Agricultural Centres to exclusively study the problems of its active cultivation and to promote it as a large scale commercial crop for better management and a more profitable exploitation. Another recent use of the plant is that it has been seen to be a very efficient soil binder and hence best suited for preventing erosion reclaiming land by bind formation. Vetiver with its oil is one of the important phytochemical potentials of our country that needs to be well managed with all the care that is needed, for example ranging from determining the soil conditions needed for the ideal cultivation upto marketing practices of assuring an optimal profit to the growers.

Names

Sanskrit offers quite a few names for this well known plant. Of all these, two: *ushira* and *virana* are the most popular. The other names are: *abhaya* (safe, conferring solace?), *amrinala* (looks

like lotus stalk but really not that?); *avadaha, daha harana* (cooling; effecting a lessening in the sensations of burning); *gandadhya* (full of fragrance); *hari priya* (loved by the Lord Vishnu); *jalamoda, jalashaya, jalavasa,* (inhabiting near watery areas or in the aquatic medium); *lamajjaka; nalada* (forming a marshy reed?), *rana priya; samagandhika, sevya* (fragrant equally all over the extensive root system); *shishira, shita mulaka* (cool, with cooling roots); *sugandhi mula* (with a fragrant root system), *vitana mulaka* (with a root system that is extensively spread out).

In English it is called *cuscus* or *khus khus*. In French, it is *vetiver*.

Names in regional languages mostly take after the two terms of Sanskrit viz *ushira* and *virana*. Among the many jungle tribes it is known as *viran*. Quite likely, Sanskrit might have taken this term as such into its own lexicon. Khas is an Arabic term meaning a type of lettuce. Its Hindi name *khas khas* is after this name though in Arabic itself this plant is known as *izkhir* or *usir*.

The plant is called as *khaskhas* in Bengali; *vala* in Cutch, and Marathi; *valo* in Gujarati; *bala, bena, khas* in Hindi; *lavancha* in Kannada; *ramacheham ver, vettiver* in Malayalam; *panni* in Punjabi; *illamichamver* (lemon like root), *vettiver* (which is the basic term for the Latin name of the plant), *viranam, auurugaddi veru, lamajjakamu ver, vattiveru, viranam* in Telugu; and *khas* in Urdu.

Botanical Aspects

This is a densely tufted perennial grass living out for a number of years together. It has a stout root stock or rhizome that bears extensively branched net like root system that is highly aromatic. Aerially it bears culms or sedge like stems that are stout and grow upto the height of 1.8 metres and these culms have also sheaths all along in most cases. Leaves are grass like and have sheaths that are compressed, especially in the lower leaves. These latter are much overlapping, sharply keeled and fan like. They are also very smooth and firm. The leaf blades are narrowly linear and have an acute apex. They are rigid, firm or somewhat spongy and usually smooth and hairless. The flowers are borne in large and loosely branched panicles; they are very slender and jointed. The branches bear sessile or stalkless spikelets which have varying and some what attractive colours such as yellowish, olive, or violet brown or purplish to almost black.

The plant is distributed practically over the whole of India and eastwards to Burma, and also throughout Malaysia and in Lower Gunea, West Indies and Brazil and the United States as well as the Mediteranean Coast of Europe. In India it is grown extensively in Punjab, Uttar Pradesh, Kumaon Ranges, specially in all tanks and running water courses along their banks or in the marshy regions below and also in Rajasthan, Chotanagpur, Kanauj and Itawah and along the Coramandal Coast and in Karnataka in the South.

Medicinal Importance

The parts used are the fibrous coiry meshwork of the roots as well as the rhizome (from which they spring) to some extent.

Chemical analysis of the material reveals that it contains a volatile or the essential oil, the oil of vetiver which is responsible for the aroma. In addition it also contains a resin, a colouring matter, a free acid, a salt of lime, an oxide of iron and woody matters. The resin smells somewhat like myrrh; it is rather acrid or pungent and deeply reddish grey in colour. The smell of the oil of vetiver is also somewhat like myrrh (*bol* in Hindi); it is also strong, acute and stable. It is the fragrant roots containing this oil that are utilised as a medicinal drug.

The pharmacological actions of the drug are as follows: it is a tonic and a refrigerant (i.e. soothing and cooling); also stimulant, antispasmodic (i.e. counteracting of spasms or uncontrolled involuntary muscular contractions and expansions), diaphoretic or sodorific (i.e. inducing artificial sweating), diuretic (bringing about profuse urination) and also an emmenagogue (i.e. that which brings about a regulation in menstrual cycle).

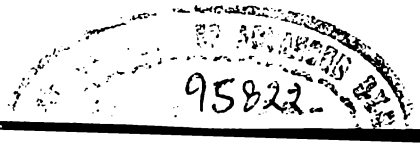
The actions attributed by the systems of Ayurveda and Siddha are as follows. It is bitter in primary taste while its adjunct taste or *anurasa* is sweet; its potency is cold. It is capable or obviating the aggravations of *kapha* and *pitta*. It is light for

digestion and employed in the following conditions: fever, vomiting, thirst, blood vitiation, burning sensations and in the diseases of *visarpa* (or erysepelas - a painful, irregularly spreading reddish inflammation on the skin), *mutrakriccha* (or difficult urination) and *vranam* (or, wounds and ulcers).

Yunani physicians or hakims of Lucknow consider this as second degree hot and dry, while the hakims of Delhi regard it as second degree cold and dry. Ayurveda considers it as cold and dry. All Yunani physicians agree that it is a good tonic to the heart and also brain and as such, a very valuable drug material. The other attributes applied are that it is a good purifer of blood, and a much beneficial drug in curing headache and palpitation or the disturbed beatings of the heart.

The plant is used therapeutically in the form of powders (when the dosage advised is 5 to 30 grains), infusion (prepared by having 1 part of the drug in 5 parts of the water - the dose being 1 to 2 ounces) or as a paste for external application. The essence or the oil of vetiver however is the most useful form; it is usually given in a dosage of 1 minim on loaf sugar.

Being a drug that is essentially cooling in nature, patients would receive it gratefully as a refreshing drink in fevers, inflammations and also the irritable states of the stomach. It has been a common practice to place a few clumps of the root permanently soaked in drinking water kept in



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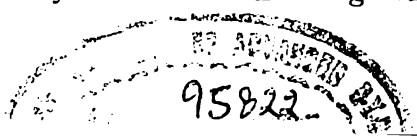

earthen ware pots particularly in the hot season. This will render the drinking water cool as well as pleasantly aromatic. Externally, a paste of the root is rubbed on the skin much like a sandal paste to get a much welcome relief from the oppressive heat and or also burning sensations of the body. Infact, there exists a regular practice of mixing this paste with a paste of red sandal wood or *Pterocarpus santalinus* and the parts of another fragrant wood known as *padma kashta* (*Prunus cerasoides*) and use this mixture as a cooling agent. A more popular use is to prepare the powder of all of these, add them to a tub of water for taking an aromatic, cooling and highly refreshing bath.

The essence or the oil is given in a dosage of two minims to check the vomitings that accompany cholera. But the most precious use of the oil is in making highly esteemed perfumes. The reason why the plant has spread all over the world is mainly due to its such an use in perfumery industry.

There is another unusual use of the grass like roots of vetiver. These are used as such in the form of cigarettes and smoked with a mixture of benzoin in order to get relieved of the headache.

The plant offers a strengthening to the brain and the heart as noted above and simultaneously it creates a feeling of pleasantry and gracefulness (*saumansya*). This is mostly used for this purpose in the form of distillation, cold infusion or *sherbet* or the cool drink. The *attar* or the fragrant essence prepared from *khus* is a very valuable scent; this is

of very delicate but highly likable aroma and extremely beneficial to persons of hot constitution. Because it confers a graceful disposition of the mind and also strengthens the heart, it is much used in upset and palpitating heart, weakness of the heart, cases of fainting and loss of consciousness and also to get rid of toxic and foul winds. It is given as a smelling agent for this purpose or in the form of a beverage for drinking. As it is palliative, and antibillious, it is employed in curing fevers due to bile complaints and the disorders of blood.

For excessive thirst in children, along with coarsely pounded roots are mixed 2-3 seeds of *kamal gatta* or *Nelumbium nucifera* similarly half pounded and both are kept soaked in a distillation of *Pandanus* flowers, filtered then and given as a drink.

Oil of vetiver or the paste of the root is very effective in destroying the foul odour of sweating. It also relieves fatigue, intoxicatedness as well as dryness of the mouth. In Guinea the infusion of the roots is used as a tonic and also as an emmenagogue.

A Prospective Suggestion

It is important to know that in spite of the much acclaimed utility of the *khas* plant, it is no where cultivated in India on any commercial scale and as per modern practices of agricultural science. The oil is no doubt distilled from the roots of this *khas*

grass but from collection from wild source this is carried out solely of the plants. Though the plant grows wild in many parts of the country, no systematic effort has been made to cultivate or find out the presence of the varieties in it and ascertain as to which one among these yields the best quality or the highest percentage of the oil. Since the plant is indigenous to India and grows widely here, such a study is bound to be useful. Moreover, the distillation of the valuable oil from the root is also carried out on primitive methods; this is done on a fairly large scale in Uttar Pradesh and Bharatpur and to a lesser extent in Punjab and Orissa.

Khas oil is an important ingredient of the perfumery industry even on the world level. It had been estimated once that even with all the primitivities involved, India exports nearly three lacs of rupees worth of this oil annually. In addition, it is strange to know that India imports considerable quantities of vetiver oil from developed countries - an oil which closely resembles khas oil in its chemical constitution. The situation urgently calls forth therefore for the required rectification.

B. KESAR OR SAFFRON

Kesar or saffron is the source of one of the oldest known and the most famous and powerful as well as fragrant and edible dye with a characteristic yellowish red or the *kesari* colour. This is a native

of Greece and Asia Minor (specially Lavant in Asia Minor) but it is now cultivated in many parts of India and China and Europe also. This is a small herb that produces lavendar coloured or brilliant yellow, purple or white flowers blossoming in the fall period when the whole field looks beautifully picturesque. The stigmas and the tips of the styles of the flowers constitute the *kesar* of the market and the raw material for the extraction of the dye. These are clipped or handpicked carefully and done so as soon as the flowers open and are then dried naturally or with artificial heat.

Kesar refers to the dried stigmatic filaments of the flower. Each filament is thin, 2.5 to 3.75 centi metres long and provided at its heads with the compressed stigmatic ends of the deep orange colour. They are slippery and sticky to touch and are of yellowish deep red colour, strong and pleasantly smelling. When mixed with water it makes it deep yellow. If *kesar* is pure it should get fully dissolved in water leaving no residue and when burnt it should not give any sizzling sound. When pressed between white paper it should not yield any dark sticky spot either.

It is widely used in preparing sweetmeats, sweet rice and *rava* dishes. It is believed to be specially good as a medicine in children. It is an important article of worship and used by the religious to make a *tilak* on the forehead.

Other tests for determining true *kesar* from the adulterated one are the following. When soaked

with water and applied over a cloth, if it immediately leaves an yellow spot, it is pure; but if the spot is first red and then turns yellow it is impure. When pure *kesar* is kept in spirit, it retains its original colour as such, even after colouring the spirit. If it is impure, its entire colour is given over to the spirit.

Kesar is one of the costliest plant products often traditionally sold along with gold and by the goldsmiths. One can appreciate the reasons for this when one realises that apart from its unique aroma, it is only a very tiny portion of the flower that constitutes the *kesar* and it takes atleast 4000 flowers to furnish us just one ounce of the dye. This colouring material is readily soluble in water; as such, it is not used in dyeing the fabrics. It is much used in colouring medicines and food stuffs to which *kesar* imparts a characteristic and unparalleled flavour.

The plant is technically called *Crocus sativus* Linn. and belongs to a family known as Iridaceae to which the many ornamental and garden species of *Iris* belong. The rhizomes of *Iris pallida* and *I. florentia* and the allied species contain an essential oil, the orrise oil that has the odour of violets. *Iris* is much cultivated in northern India (and is available in the market as the orrish root) and also in Europe and Iran.

Saffron cultivation dates back to the times of the ancient Greek and the Hebrews. It is an important commercial crop now in many parts of Europe and

the Orient. Saffron was of particularly great importance during the Middle Ages in Europe mainly because of its real as well as just fancied value in medicine. To-day it has actually lost some of this great reputation but it is by no means a plant of lesser value as a consequence of it. In India, it is one of the most highly prized spice and flavouring agent for food. Saffron cakes are quite popular in England and this saffron serves as an ingredient of many dishes in the Continent also, the famous French boruillabaisse being one of them.

Kesari is one of the famous colours of India. It enters into the composition of our National Flag as a symbol of sacrifice and valour. Kesar coloured sweets are also very much praised though the colour used here is artificial, the true *kesar* being prohibitively costly. The term "crocus" comes from the Hebrew word "Karkom" and the Arabic "Korkam." The term saffron is related to the Fresh safran and finally the Arabic Zafaran. The English meadow saffron refers to *Colchicum autumnale*, a tulip like herb of Europe and North Africa yielding an important alkaloid colchicine used in rheumatism and gout. Bastard saffron or saffron is *Carthamus tinctorius* (*kusumba* in Sanskrit and *kusum* in Hindi). This is an important Arabic dye plant and a native of India. The colour in both of these two plants is yellow based. The term *kesar* as already noted refers to the fine filaments within the flowers that constitute the officinal part of the plant. *Naga kesar* is the name of the plant called

Cobra saffron in English and is so named because the filaments here form a cobra like hood.

However, this most useful and costly spice grows only in the Jammu and Kashmir region of India. Even there, the cultivation is carried out in a restricted area viz 27 villages in Pampor Tehsil of the Kashmir valley and 6 villages of Kastavad pathad of Jammu or to speak more specifically in the Matta village of Jammu and its neighbourhood. There also occurs a difference in the *kesar* of these two regions. Pampor *kesar* is presumed to be of much older origin. Matta *kesar* is whiter than desirable to a degree while the Pampor *kesar* is more fragrant. More interestingly neither the attempts to carry out a better cultivation nor to extend the cultivation of *kesar* to other areas even in Kashmir, for instance in Palvama, Padgam and Baramullah, have shown any effect on the final yield of Kesar. In Pakistan it is cultivated around Quetta. The crop is thus a highly endemic type in its distribution and continues to flourish only in the very restricted areas to which it has been accustomed to, since ages together. It is these factors that also add to the extravagant costliness of the drug.

Names

Sanskrit offers a considerable number of names such as *agnisekhara, agnishikha* (with a flame red tuft of the flower filaments), *aruna* (pink); *asra, asrika* (blood red), *bahlika* (from the Bahlika region, Asia Minor?); *chandana* (fragrant like the

sandal wood); *charu* (beautiful), *dhira dipaka* (like a burning lamp), *gaura* (yellowish); *ghasra, ghusruna, harichandana, jaguda; kishara, kaisara, kaisara, kaliyaka, kanta* (very pleasing), *kashmara, kashmiraja, khala, kumkuma, kusumatmaka, lohita* (red); *pishuna, pitaka;* yellowish; *rudhira* (red) *saurabha* (very fragrant); *shatha; varabalhika.*

In English it is known as Saffron, Saffron crocus or Spanish saffron, Spain being one of the important European centres of cultivating *kesar.* It is Safron in many European languages.

It is called *jafrana, zahafaran* in Arabic; *jafran* in Bengali; *keshar* in Gujarati; *kesar, zofran* in Hindi; *kesara* in Marathi; *kesari, kumkuma kesari* in Kannada; *kum kuma pu* in Tamil; *kumkuma puvu* in Telugu; *jafranekar* in Urdu.

Botanical Aspects

The flowers of *kesar* are quite pretty and look like dangling agile tubular needles as it were. The plant is a perennial onion like herb of 1,1/2 feet high wherein the root stock forms a swollen corm, which is sheathed. Apart from this corm which is a modified stem, there is practically no other stem at all and the corm itself is covered closely with sheaths that form a compact net work. Leaves are all radical viz. arising directly from the root level; they are narrowly linear, channelled longitudinally and have their margins recurved. Flowers are solitary or fascicled; when latter, they appear on a scape viz a central, smooth, upward axis bearing a

clump of flowers, there being basal spathes (or large sized bracts) embracing it. Perianth is funnel shaped with a very slender tube; throat of this perianth has a beard like out growth. Limbs of the perianth are subequally 6 lobed and occur in 2 series. Flowers are usually violet and they appear in the autumn along with the leaves. Stamens occur on the throat of the perianth; the anthers that they bear are yellow in colour. Ovary is three celled and the style it bears is thin and slender or filiform. It is the extended arms of this style which is orange red in colour and has subclavate or rather clublike tips that forms the *kesar*. The fragrance of the flower is that of the honey which is secreted by the nectar gland situated over the ovary. This necarine gland gradually grows upto the throat of the perianth tube. Pollination takes place by means of honey bees or the butter-flies that visit the flowers in search of the honey. However, self pollination also occurs.

For a beautiful and constant development of *kesar*, bright sunshine is a curse. That is why the selection of the flowers and the picking up of the stigmas both start before sun becomes bright. The total output of the pick is divided into four series. These are designated as *shahi jafaran, mongra, laccha* and *turaila*. These are all of decreasing value viz *shahijafaran* is the best and *turaila* is the worst.

Dried stigmas and tops of the styles of *Crocus sativus* constitute the saffron of commerce. This is often compressed into cakes and is called cake

saffron. The ordinary saffron is known in commerce as the Hay saffron.

Ayurvedists recognises three varieties of *kesar* following Bhavamishra. They are *kesar* from Kashmir which is fine *kesar* deep red in colour, resembling lotus bloom in aroma and considered the best; *kesar* from *Bahlika* (Bokhara) is also fine but of white colour and having an aroma of *ketaki* or pandanus flowers; and, the third one which is from Iran, rather coarse, somewhat white in colour and having an aroma of bee's honey; this is the worst. In the absence of *kesar*, the filaments of Bastard saffron or *kusumbha* can be given as a substitute for medicinal purposes.

The plant is propagated from seeds and also the offsets of the bulbs more commonly. *Kesar* thrives best in cold regions with warm or subtropical climates and requires a rich, well drained, sandy or wamy soil. In Kashmir-Pamipur, near Srinagar, bulbs are transplanted in August to September in raised plots of 5 square feet that are surrounded by 9 inch wide drains - all of which are meticulously laid out previously in well pulverised or powdered soil. The plots are also thoroughly hoed and weeded. But once these matters are attended to, no manure is applied and once the plants are established, no irrigation is needed either. In Kishtwar of the Jammu area where the soil is lighter and well drained, the bulbs are planted on flat ground. When the bulbs are once established, they continue to live for 10 to 15 years, new bulbs being produced annually and the

old ones disappearing gradually by rotting away.

The net yield of saffron in both Kashmir valley and Jammu is much lower than in other countries. In Spain, saffron is mainly an irrigated crop while in France, it is uprooted every three years and in Italy it is grown as an annual crop with replantings done fresh every year.

The flowers are picked very early in the morning even when half open, so as to avoid the heat of the rising sun. The stigmas are then separated and immediately transferred to sieves that are placed on earthen kilns or pots and on a slow fire. It is necessary to apply gentle heat; for, otherwise, the material gets softened up and is likely to deteriorate. Because of the sheer cost of the material and the exacting operative conditions, saffron is very frequently adulterated with styles, parts of the flowers other than the stigma viz. the anthers, parts of corolla or even the exhausted flowers or floral parts of some of the other flowers like those of Calendula or Carthamus viz. bastard safflower or even corn silk, wood, fibres coloured with coaltar dyes and so on. In addition, water is also added to increase the weight. Cake saffron for instance often contains safflower florets with adhesive or gluey sugary substances.

Constitution

Chemical analysis of *kesar* consists of the following: Three crystalline colouring matters called as A. crocetin (forming 0.7 per cent of

saffron), B. crocetin (making up 0.7 per cent) and Y crocetin (making 0.3 per cent). There also occur a volatile oil responsible for the smell, being 8 to 13.4 per cent; crocin, a glucoside, slightly soluble in water but freely soluble in alcohol and alkaline solution-forming 65 per cent of the polycroit which is the name given to the total colouring matter; picro crocin - a bitter principle, wax, proteids, fixed oil 1.37 per cent, mucilage, sugar (in the form of glucose?), ash 5 per cent and moisture 12 per cent. The ash is rich in potassium and phosphorus and also contains traces of boron.

Crocin is a toxic glucoside obtained from many species of the genus *Crocus*.

Medicinal Importance

Kesar is a very highly employed and much valued drug material in the Indian Systems of Medicine. Even here it is more popular in the Tibbi and Yunani systems of medicine. It enjoys a very high reputation as a drug that is stomachic (viz. good for the stomach) and also as an antispasmodic or counteracting spasmodic muscular contractions. As a stimulant and an aphrodisiac viz. promoting the urge of sex, it is so universally esteemed that is regarded as a unique and a royal agent here not to be approached by any other drug in the whole of the materia medica. In European medicine at present however it is rarely used as a medicine; its almost sole use is in cooking and as a colouring and the favouring material.

It has an unique aromatic odour and a bitter, pungent taste. It is also an anodyne to some extent i.e. a medicine that allays pain. It also has an emmenagoguic efficacy of regulating menstrual cycle. But in over doses, it is a narcotic poison. It is always used therefore in small doses of 1/4 to 1/2 grain. Ordinarily, the dosage is just 1 to 3 grains.

Ayurveda and Siddha regard it as being bitter in the principal taste with an amount of pungency as the adjunct taste or *anurasa*. It is viscous in quality and a colouring material. It is capable of overcoming the aggravation of all the three *doshas*. As a drug it is used in vomiting, wound healing, destruction of worms and also in the diseases of the head. It is good at removing phlegm or *kapha*.

Yunani physicians consider it as 3 degree hot and 1 degree dry, refrigerant, tonic, diuretic (promoting urine flow) and a stimulant and as being good for vision, tones and the uterus. The other characters attributed are: it confers a sense of gracefulness (*saumanasya*), dissolves swellings and is scarifying or slimming down. It is prevalently used to overcome unwholesome qualities of other medicines. It strengthens heat, brain and liver and the body as a whole. When mixed with other medicines it rapidly distributes their good effects. In feeble vision, it is used alone or first thinned with others and then used as a colyrium. It is reputed to overcome impotency. Its enriches blood. The two deleterious effects are: it

causes a weakness in the kidney and destroys hunger. The agents that can overcome these ill effects are: *jarishk* (the fruit of *daru haldi* or *Berberis aristata*) and anise. Substitutes are: the seeds of *bijaura nimbu* and nut meg. The dosage is 1 to 2 grams.

In painful menstruation its use in full dosage secures relief: a pellet of *kesar* is also placed and kept in the uterus then. Its application over the breasts hardens them. For cold and running nose in children it is mixed with milk and given for drinking; its application is also done then over the temples, the nose and the chest.

It is employed in small doses in fevers, melancholia (oppresive sadness), enlargement of the liver and in spasmodic cough and asthma. It is given in anaemia and seminal debility. Its use results in a yellow coloured urine. It is given in neuralgia (nervous pain) and also rheumatism and for children along with ghee for looseness of the bowels. It relieves colicy pains and also menstrual disorders like its absence, disturbance or the white discharge.

Externally saffron is used in headache and as a paste in bruises and superficial sores. It is an excellent palliative for piles.

For the health of aged birds like parrots and myna, specially when they are moulting or otherwise sickly, a few threads of *kesar* are given infused in water.

Even the leaves of the *kesar* plant have some use; they are vulnerary viz. effective in treating wounds and are also useful in fractures and pain in the joints.

A few household remedies are as follows:

Giving a pellet of *dalchini* and *kesar* relieves stomach pain.

Giving a pill of *kesar* and *akalkara* (pyrethrum roots) regulates difficult menstruation.

Liver enlargement responds well for a drink of *kesar* rubbed in bitter gourd (*karela*) juice.

Plethora or *rakta pitta* also responds well for a drink of *kesar* rubbed in goat's milk and warmed up. This is to be continued for a few days.

Rub *kesar* in old ghee as a sure cure for old urinary obstruction and stones.

For hemicrania or onesided headache, let the patient smell *kesar* thinned in old ghee.

Modern Work

Modern trials do not reveal any special point by which *kesar* differs from other essential oil yielding plants as regards its highly reputed aphrodisiac efficacy. This may be just due to the slight stimulation of the Central Nervous system which is common to all essential oils.

Saffron bulbs are tonic to young animals and the *kesar* itself in over doses is a narcotic poison. *Kesar* is also said to have antiseptic properties.

C. NAGAKESAR, COBRA'S SAFFRON

Ayurvedically both *kesar* and *nagakesar* belong to the same group of drug plants viz. *karpuradivarga*, but botanically this is a totally different plant known as *Mesua ferrea* Linn belonging to a family of hard wooded trees i.e. Guttiferae. This is an ever green, beautiful and medium sized tree. The trunk is round, straight, smooth and slippery and grey in colour. Branches are tender and graceful. Bark is 1/4 inch thick, smooth and slippery and ash coloured. The wood inside is reddish yellow. Leaves are opposite, somewhat drooping, shiningly green above and whitish below. Flowers bloom in spring and these are white, fragrant and bear a hood like tuft of the stamen's because of which the plant receives the name of *naga kesar*. It is these filaments that constitute the drug material. Fruits appear in autumn. They are spherical and rather pressed down at the end and become rather red on ripening. The fruits produce a resinous secretion.

The tree is available in abundance in many parts of our country, specially West Bengal, Eastern Himachal Pradesh, Nepal, Cooch Bihar, Assam, Tamil Nadu, Konkan, Western Ghats and also in the Andamans and Burma upto 1000 feet in altitude. As both flowers and fruits are fragrant and beautiful the tree is commonly grown in the gardens.

What is usually sold as *nagakesar* in the market spherical, reddish, non aromatic seed like

structures are not the true stuff. They are probably the fruits of *dalchini* and are known as black or *kala nagakesar*. The true *nagakesar* which is described here is often called Bengal *nagakesar*; the stamimal clump within the flowers here forms a bunch like structure. There is one more, known as the red *nagakesar*, quite prevalent in the North which is the flower bud of a different plant altogether viz. *Ochrocarpus longifolia* but of the same family Guttiferae. The flower buds of one another plant of the Guttiferae family viz. *Calophyllum inophyllum* are also similar and is also called as *nagakesar* some times or as Burmese or Ceylonese *nagakesar*. They all share one common feature; fragrant clump of *kesar* like filaments in their flower buds. They are all strikingly fragrant and of a dense odour.

Names

Some of the names in Sanskrit are *nagakesara, kesar, champeya.*

In English, it is Cobra's saffron.

In Hindi, it is *nagakesar* (yellow), *nagesar, naga champa; nagakesar* in Marathi and Gujarati; *nagasampige* in Kannada; *velluta champakam* in Tamil; *naga champakam* in Malayalam.

Medicinal Importance

The parts used are the flower buds, flowers, fruit, seed, root, bark and oil.

The young unripe fruits contain an oleoresin from which an essential oil is secured. Seeds have a fixed oil (36-48 per cent) that is useful in soap making while the hard pericarp or the fruit wall has considerable tannin. The resin from the fruit exudes out as tears that harden up; this dissolves in benzoin. The essential oil secured is very fragrant, pale yellow in colour and has the same odour as that of the flowers. There also occur two bitter principles.

Dried blossoms which is how it is sold in the market and also the roots and the bark are all bitter and sweat causing. The bark is mildly astringent while the unripe fruits are aromatic, acrid or pungent and purgative. The oleoresin that exudes from the fruit and also from the bark and root is aromatic and demulcent i.e. cooling and soothing. Blossoms are astringent and so also are the dried flowers; they are also stomachic. The flowers are in addition, carminative i.e. can remove gases from the stomach.

Ayurveda regards *nagakesar* as a very useful drug and employs it in many ways. It is light for digestion, dry, astringent, bitter in post assimilation, somewhat hot in virility, palliative of *pitta*, stimulative, digestive, thirst quenching and strengthening to liver, stomach and brain. It helps in preventing bleeding and is diuretic. It destroys foul smell and removes sweat. it is employed in weak brain, insanity, feeble digestion, nausea, vomiting, flatulence, piles, worms of the bowels, diarrhoea and dysentery and fever.

Its paste is applied to remove bad smell and sweat and also on wounds. The dry powder is sprinkled over wounds to dry them up. In hoarse voice, it is kept in the mouth along with sugar candy and cardamom. In cases of burning sensations, it is mixed with ghee washed 100 times and used for massaging. Or, its powder is mixed with sugar and butter and then applied; this is excellent for piles.

Leaves are used as poultice to be applied over the head in severe cold. Bark and root are bitter tonics used in the form of decoction, infusion or tincture; these are also useful in bronchitis and gastritis. The oil from the seed is an excellent application for skin affections such as sores, scabies, wounds and ulcers, and also in rheumatism. Dried flowers are much used as a fragrant adjunct to decoctions and oils much like *kesar*. These are powdered, mixed with ghee or its paste is made with butter and sugar; these are then given in bleeding piles and also in dysentery with mucus. This is beneficial also in thirst, irritability of the stomach, excessive perspiration, cough where there is much phlegm and in dyspepsia or mild indigestion. A syrup of the flower buds (1 in 10) is given for dysentery.

Nagakesar is a cooling, pain mitigative and blood conserving (*rakta samgrahaka*) drug. It is an excellent medicine for burnings at the hands and the feet and also for bleeding piles. It is best given in highly phlegmatic cough. The seed oil is a good material for massaging in rheumatism and body

pain. The filaments or the *kesar* here are soaked overnight and the water drunk after straining along with honey or sugar; continued for a few days it cures bleeding piles and dries them. The *attar* or the scent from this is given in a dose of a *ratti* for eating with betel leaf; this will cure impotency.

As noted above, Ayurveda considers two different plants *Mesua ferrea* and *Ochrocarpus longifolius* as *naga keshar*, the former as the yellow variety and the latter, as the red variety. There is one more plant *punnaga* considered to be allied and this is *Callophyllum inophyllum*, botanically. All belong to the same family viz. Guttiferae and all have densely fragrant and beautiful clumps of a large number of stamens in their flowers that constitute the chief crude drug material. We shall consider all the three of these *nagakesharas* comparatively.

1. The Yellow Nagakesar

Names

Sanskrit calls this as *nagakesar, chaampeya* (somewhat similar to *champaka* flower viz. *Michelia champaka* in its denseness of the fragrance) and *nagapushpa.*

In Hindi, this is known as *peela nagakesar*; in Gujarati, as *peelu nagakesar*; in Marathi, as *nag chaampha*; in Bengali as *naga kesar, nageshwar*; in Telugu, as *naga champakamu, naga kesaramu*; in Kannada as *naga sampige.*

English calls it Ceylon Iron Wood or Iron Wood of Assam (in recognition of its very hard wood). Botanically, it is *Mesua ferrea* Linn.

Botanical Aspects

The tree is neither very big, nor quite small; it is medium sized and has a very hard wood. The trunk is straight, slippery and greyish. The branches are tender and the whole tree is quite graceful with the young dense leaves that are red to start with, adding to the beauty, later turning to dense green that are shiny as well, on the upper side. The under side of the leaf is hairy; the leaf is stalked and the leaf blade has a straight uncut margin and veins that are quite prominent. Flowers are of 1-3 inch diameter, very fragrant and arise in the axils of the leaves at the ends of the branches, either singly or often in pairs. The sepals are green and four in number the outer being smaller and the inner being longer. The petals are also four, but white and these enclose the yellow clump of the stamens, all joining together in a fleshy ring below. Fruit is 1-1.1/2 inch long, ovoid or egg like and covered by the enlarged sepals. Seeds are triangular and slippery.

The trees are found rather scatterred in Himalayas, Bangladesh, Assam, Andamans, South Konkan and the Western Ghats.

The clump of the stamens is its chiefly used part.

Medicinal and Other Importance

Ayurveda considers *nagakesar* as pungent and astringent in taste, light in digestion, and dry in quality and mildly hot. It is used beneficially in the following afflictions: fever, thirst, itching, excessive sweating, vomiting, foul smell, skin diseases, and in the destruction of *kapha* and *pitta* aggravations as well as poison. This is particularly useful in warding of *vatic* troubles of the bladder (*basti vata*) and also the pains in the throat and the head.

This forms an excellent drug in excessively bleeding piles, dysentery accompanied with blood, discharge of blood during cough and plethora - for instance, the bleeding at nose.

The unripe fruit of *nagakesar* is fragrant and can be used to promote much sweating. The flower buds are useful in diarrhoea.

The oil secured from the seeds is useful for external application in rheumatic swellings. This is useful in soapmaking also. The bark of the tree is a useful ingredient to augment the sweat promotive property of other drug materials.

The stamens are much used in the complaints of cough. They are astringent and bitter in taste; cold in virility; bitter in post assimilation and can counteract the aggravations of *pitta* and *kapha doshas*. This is mostly powdered and given in a dose of 6 *rattis* to 1/2 a *tola*.

Some of the well recognised uses of the stamens are as follows: These are all taken from specific classical authors as indicated.

Charaka: In bleeding piles. Add half a *tola* powder of *nagakeshar* with butter and sugar and give. This is very beneficial.

In hiccup. Take one *ratti* of its fine powder, mix it with honey and sugar candy and give. Follow with a drink of sugar cane juice.

Raja martanda: For a good male child. The advice given is to consume half a *tola* of the powder at the time of the periods along with cow's ghee and as a *lehya* (i.e. to be licked up) and follow this with a drink of cow's milk and keep taking cow's milk in plenty.

Shodala: For rakta pradara. The powder of the stamens of *nagakesar* is to be given along with honey and in rice water, morning and evening. The patient should be given as diet just *lassi* or butter milk.

Vangasena: In dysentery accompanied with bleeding. Giving the powder of *nagakeshar* along with sugar candy will cure this well.

Sushruta, another great Acharya of Ayurveda has also given plenty of useful references to *nagakesar.* He regards this as a drug that destroys phlegm or *sleshma* and *billiousness* or *pitta* and also poison. He advises it to be used to purify vitiated water - somewhat like the true *kesar.* He

enumerates it along with many other plants that are capable of overcoming poisons. It is given along with other drugs in cases of fever due to *kapha*.

Chakradatta recommends the use of the powdered flowers mixed with old clarified butter or ghee that has been washed hundred times in water as an effective cure for the sensation of burning at the feet. This is itself applied in bleeding piles with much benefit.

Some Special Preparations

Bleeding Piles: The powder of *nagakeshar* is to be mixed with butter and sugar and taken then daily. Or mix along with this powder an equal quantity of the powder of the blood red gum of *Dracaena cinnabari* Balf or what is called Dragons blood in English or *khoon kharaba* in Hindi. Give this in a dose of 2 *mashas** 3-4 times a day in the juice of such fruits as *musambi*, sweet pomegranate or that of *durva* grass or green and fresh coriander leaves.

Yunani physicians advise to soak 13 *mashas* of this drug in water over night, strain next morning, add sugar candy or honey and administer as a drink. A few days of this treatment will stop the bleeding.

Or, administer this powder with equal quantity of sugar morning and evening. This is to be

* 10 *mashas* = 1 *tola* = 10 grams: 1 *masha* = 8 *gunzas* or 8 *rottis*.

followed with an eating of 2-3 fig fruits (*anjir*) soaked over night in water. Oil, chillies and sour things should be avoided during the treatment.

For stopping abortion and getting a valorous son. The powders of *nagakeshar* and *betel nut* are to be mixed in equal quantity. This is to be taken in a dose of 2-3 *mashas* along with cow's ghee starting from the commencement of the periods to fourteen days. The foetus will stand firm and there is no fear of abortion.

Taking its fine powder along with cow's ghee during the time of the periods and to sustain oneself only on cow's milk will ensure the birth of a valorous son.

In case abortion is threatened before the third or the fifth month, and there is much pain in the uterus, the powder of *nagakeshar* is to be mixed with sugar candy and *vamsha lochana* or bamboos manna (the watery crystals that get collected on the bamboo plant) and this mixture is to be taken in raw cow's milk.

Flowers of *nagakeshar* are employed in flatulence (bloating belly due to gas) and piles. In flatulence it is given as an external application and ground with black pepper. Grinding them with water and applying at the feet will remove the burnings at the feet. This will quieten the burning of the piles also. Such a paste is much utilised to render other oils and decoctions fragrant much in the manner as the true *keshar* is employed. The

attar or the essence prepared from these flowers is believed to destroy impotency in man. This is given in a dose of one *ratti* along with betel leaf.

Leaves are hot, pain relieving, softening and counteracting to poison. Leaves are ground and then mixed with milk and coconut oil, warmed and tied as a poultice in headaches due to cold or *vata*. This gives beneficial results in running nose and cold as well as headache.

Leaves and flowers are much used in Bengal for scorpion strings and snake bites. Their external application is carried out or they are mixed with water and given as a drink.

The bark and the root are made into a decoction which is a remedy in cough, bronchitis and gastritis or the inflammations of the wind pipe or the stomach, respectively.

The oil of the seeds is a pain killer. It is much used as an external application in rheumatism, arthritis, pains due to *vata* as well as many skin afflictions such as itching, eczema, and others. A little amount of *kamala* or *Mallotus philippinensis* viz. it crimson powder, is added to this oil.

The gum is fragrant and softening. It yields an oil on being soaked. This oil as noted earlier is good for complaints of the eyes.

The plant is rather deleterious to persons of bilious complaints and those that are of hot constitution. The counteracting agents are

vamshalochana (the bamboo's manna), pure hone and the seed of *kesari* or *Cichorium inhybus* or th chicory.

2. The Red Nagakesar

Names

Sanskrit calls it as *surapunnaga* (the god's *punnaga* - the plant which we shall discuss next), *nameru; suraparnika* (with godly i.e. very impressively dense and green leaves).

This is known as *nagakeshar* or *lal nagakeshar* in Hindi and Bengali; *surangi, lal nagakeshar* in Marathi; *retinagakeshar* in Gujarati; *suraponna* in Telugu; *suragi, gardundi, punnaga, pune* in Kannada; *nagagesarappu, nagappu* in Tamil and *naramushka* in Persian.

In English, it is known as Alexandrian Laurel. Botanically, it is *Ochrocaspos longifolius* Benth & Hook.

Botanical Aspects

This is a very lofty tree. Leaves are thick, 6 inches long, 2 inches broad, oval, slippery and the margins are wavy and the blade is densely green. The ribs are faint in the tender leaves but become prominently visible with a very strong central midrib and a number of parallel laterals and a close net work of many smaller ones all over the blade. The stalks of the leaves are strong and firm.

Flowers are many and occur in an abundance of small bunches and are rather orange coloured. Sepals are many and divided into two parts. Petals are four. When the flowers bloom they are impressive and will compulsively attract attention. Fruit is spherical, about 1 inch in diameter, with a hard coat, a pointed end and it is nut like. What are called *lal nagakeshar* by Ayurvedic physicians happen to be the unopened flowers of this tree.

The tree is met with in the forests of the West coast of India mainly from Konkan to South Canara. At some places, for example in gardens, the tree is cultivated.

Medicinal and Other Importance

The medicinal properties of the red *nagakeshar* are similar to those of the yellow or the usual *nagakeshar*, though it is generally regarded that the yellow "variety" is better than the red one. It is advised that the yellow one should endeavour to employ. But, in case this is not available easily, the red one can be used as its effective substitute.

The fruits of this tree are edible.

The dried flower buds are stimulant, aromatic, stomachic (i.e. good for the stomach), bitter and astringent. They are best used as fragrant adjuncts to decoctions and medicated oils. They are very much used like cinnamon, cardamoms and other aromatic spices, in quenching excessive thirst, irritability of the stomach, excessive perspiration

and are also given within, beneficially in dysentery. Their paste is employed to fill up the cavities in tooth with carries and to relieve the tooth ache. Flowers are useful in some forms of indigestion and also in piles. The drug is presumed to be useful in scorpion sting.

Ayurveda regards its properties as being aromatic, astringent (i.e. contractive of living tissues and hence healing), bitter and pungent. It relieves pain and stimulates digestion.

In cases of excessive thirst its powder is dropped with those of cloves and cardamums in water, mixed well and given as a drink. This forms a delectable and cooling drink which also relieves much of the stomach pain.

The flowers are placed in water meant for bath or their distillation (viz. an *arka*) is prepared first and this *arka* is added to the water. Bathing in such a water will render the patient complaining from bilious troubles, free from them. He will feel much gladdened by such a bath.

The dosage advised is 1 to 2 *mashas* of the powder of the dried flower buds.

3. Punnaga

Names

Sanskrit calls the plant as *pumnaga* (i.e. the male viz. the better *naga* tree), *tunga* (the lofty), *nameruka* and *pancha keshara*.

In Hindi, this is known as *sultan champa* (the King's *champaka* flower), *surpan, surpanka;* in Bengali, as *punnaga, sultan champa;* in Marathi, as *undal, oondi, surangi, naga champa;* in Telugu, as *punnagamu, ponnachetty;* in Tamil, as *punnagamu, punnai virai;* in Malayalam, as *cherupuna, punnakam, betan;* in Kannada, as *surahonne, pinnay.*

English calls it as Alexandrian Laurel, Pinnay Tree.

Botanically this is *Calophyllum inophyllum* L. However, it is important to note that there are two other species of this plant which occur in India and are closely similar to it. All the three species are well distinguished by their names in Kannada as follows. They are *C. inophyllum* L (*sura honne*, the godly *honne*), *C. apetalum* willd. Wt (*kai honney, kiri honne*, the stony and the smaller *honne*) and *C. tomentosum* wt. (*hole honne, shri honne*, the riverine and the auspicious *honne*. The Poon Tree in English).

Botanical Aspects

This is a very beautiful tree though of a medium size in growth and usually not so lofty as the True Alexandrian Laurel or *Ochrocarpus longifolius* discussed above. Leaves are 5-5.1/2 inches long, 3-3.1/2 inches broad, oval and slippery as well as smooth, thick and shining with their tips obtuse. They are densely green and give a good shade. Flowers are very fragrant and densely so. They are

white and occur in bunches. Both the sepals and the petals are four each in number. Stamens are numerous, united at the base but broken into four or more parts. Fruit is 1 to 1.1/2 inches diameter, slippery, yellowish white in colour, somewhat fleshy and bear within the famous oil seeds that yield a highly important medicinal oil called Pinnay oil used in rheumatism.

The plant occurs near the sea coast throughout India and also in Burma, Malaya, Andamans and Sri Lanka.

Medicinal and Other Importance

The parts of the tree that are used variously are barks, the seeds and the leaves but most importantly the bitter oil from the seeds and to a lesser extent, the resin or the gum from the stem surface.

The resin has an odour of parsley or *ajmoda* (*Petroselinium*) and resembles myrrh and is soluble in alcohol. The soft kernel of the seeds yields an oil that is dark yellow in colour and is quite fragrant in odour.

The bark of the tree is astringent (viz. contractive and healing) while its juice is purgative.

The oil is rubefacient (i.e. reddening) and irritant to skin. It is particularly on the thin mucous membrane of the urino genital organs that the oil is a reputed and a specific drug.

The use of the oil is however only as an external application. The tree also produces a gum that is emetic (i.e. vomit inducing) and also a purgative.

Ayurveda considers it as sweet, bitter and astringent in taste, cold in virility, light in digestion and sweet in post assimilation. It is palliative to *kapha* and *pitta doshas.*

The oil from the seed is used as a massaging oil in cases of rheumatic complaints. A slimy exudation occurs on the bark of the trunk of this tree. This is believed to be as beneficial as *kankushta* or gum gotti or the resin of *Garcinia morella* or *lalres* in Hindi. This is very efficaciously employed as an external application to highly vitiated and non-healing ulcers.

If the branches of the tree are incised, a type of gum gets exuded. When this gum is mixed with water and left as such, a type of oil forms at surface layer floating on the water. Gum mixed with strips of bark and leaves are steeped in water to yield an oil similarly. This oil is employed in curing wounds in the eyes.

In Java the tree is famous for its diuretic property or the capacity of promoting profuse urination.

As the seed oil is beneficial to the delicate membrane of the male genital organ, it is used as almost a specific remedy in recent as well as chronic complaints of a gonorrhoea patient. The other use of oil is for massaging arthritis,

rheumatic swellings and so on. In case the oil is not available seeds are powdered and pounded with water and applied thinly over rheumatic regions and also in *vatarakta* (gout). This procedure will get rid of the pain as well the swelling.

It is not clear whether there exists a poisonous principle in the oil of these seeds or not. But some Yunani physicians have asserted that the oil can be safely given as an internal medicinal also and with no adverse results. They regard it as a safe and an excellent medicine. They very much extol its specific proficiency in the genital organs, bladder and the kidneys and particularly over the delicate mucous membranes of these organs. They point out that the application of the oil even once is attended with beneficial results.

In Malay Archepelago, a decoction of the leaves of *punnaga* is employed as an eye drop in cases of swellings of the eye. The seed oil is considered to be curative of *pama* or the scab.

Ayurvedic physicians claim that the bark of this tree is astringent viz. it causes contraction of the living tissues and is particularly beneficial in stopping internal bleeding. The juice of the bark is definitely purgative. Patients of rheumatism and *vata rakta* (gout) are advised to take bath after applying its oil all over the body externally.

Commentators on Ayurvedic classics have somewhat confused the identity of *chaampeya, naga pushpa* and *punnaga*. They are all different

plants. *Chaampeya* is another name for the yellow *nagakeshar* (*Mesua ferrea*); *nagapushpa* also refers to the same plant; but *pumnaga* is *Calophyllum inophyllum.*

Even in modern medicine, oil from the seeds is a famous medicine. This is known as Pinnay oil or Domba oil in Europe and is a highly esteemed application in rheumatism. It is also employed in cases of gonorrhoea, gleet and scabies or itching. Gums severed from the wounded bark is a good remedy in wounds and ulcers. The decoction of the bark is a good washing as well as a healing preparation for indolent viz. lazy and non-healing wounds and ulcers. Leaves as such or soaked in water are applied to inflammed or swollen eyes. Oil from the seeds is a stimulant application in rheumatism.

D. KHASKHAS-OPIUM

In popular parlance, the term *khaskhas* or *khuskhus* refers to the seeds of poppy or opium, the most famous and a very old narcotic drug. Here, the dried juice exuding from the injured capsules forms the drug material. The plant originated from Asia Minor but its use soon spread westward even in ancient times to the Greeks, the Romans and the Egyptians and the early lake dwellers of Switzerland. By eighteenth century it had reached Persia, India, China and since then has spread all the world over. When used judiciously, it is a great blessing to mankind in the

relief of pain but its excessive use results in an opium habit that has caused and is still causing unbelievable suffering and evil - an unparalleled means for colossal tragedy and corruption. Inspite of even international effort the opium habit seems to still flourish in ever fresh and devious ways, specially in the Orient where it has taken millions of lives already. It has been estimated that over 900,000,000 people still use it.

From the first use of a bit of opium to get sleep or a momentary pleasure it is too easy to go to the point where the very existence becomes impossible without it for the doomed addict. The first reactions are pleasurable with alluring dreams and enticing visions. Continued use however leads to a delirium and death. The addict lacks the very will power to resist the craving for opium and even if he succeeds, the with drawal pains are so acute that it proves almost impossible for him to persist in abstinence.

In India opium is eaten and the habit had been very prevalent till recently. To-day its production and trade is a government monopoly but much corruption and smuggling do occur. Chinese situation has been still worse; the usual method here is smoking opium, thus absorbing more morphine and having greater effects. European Powers, the Portuguese, the Dutch and the English in turn have exploited opium to the detriment of the oriental countries in the recent past. There has been opium wars in China. The whole Chinese nation had shown in the past the effect of opium

habit and its cultivation was so profitable that once in that vast country very little food crops were grown in almost every province. In Europe and the United States, the many derivatives of opium such as morphine, heroin, codeine and others have become grave national problems of international smuggling necessitating narcotic laws and the great concern that the World Health Organisation is displaying towards its regulation. Drug addiction and rehabilitation of its victim have become a crucial engagement of modern society and the medical World.

The use of opium in medicine has also been ancient. Egyptian papyri of 1600 BC records its use by their physicians (other drugs of this list are: cannabis, myrrh, aloes, hemlock and cassia). Opium or poppy is an annual herb with large showy white flowers. Soon after the petals fall, the capsules are incised with a sharp knife in the early morning and the white latex exudes from the cut slit and hardens quickly. This is scraped off and made into balls or cakes often wrapped in the petals of the same flowers. This crude opium is brownish and contains nearly 25 alkaloids, the most important and the powerful being morphine and codeine. Medicinally they are used to relieve pain, induce sleep and release spasms. The oil seeds from the dry capsules are edible and these constitute *khaskhas*; these are also useful industrially. Unripe fruits are eaten like a vegetable. "Opium" is a term derived from the Greek term "opos" meaning sap. This plant is

called poppy in English—a term which as Pexton's Botanical Dictionary explains is derived from papa, pap or thick milk, as the juice of the poppy was formerly used in children's food to make them sleep. It is technically known as *Papaver somniferum* Linn. and belongs to the family Papavaraceae; another very familiar plant of this family is the Mexican Pophy or *Argemone mexicana*, a common weed everywhere familiar now with its prickly fruit and the yellow flowers. This is known as *satyanashi* in Hindi.

Members of this family Papavaraceas are almost all herbs, annual or perennial. Very rarely they may be shrubby as in *Bocconia*. They exude white or yellow dense liquid from many regions of their body. Leaves are alternate, simple and the margin is thrown into teeth or it is dentate; they are often much divided and occur in close clusters. Flowers are always large, showy and in colour they are yellow, red, rose or white. Calyx contains two or three sepals that are rather large and fall down as soon as the flowers opens. Petals inside are free and range in number from 4 to 6 or 8 or even 12 and these are arranged in two cycles, one over the other. There are no honey glands. Stamens are many, free and quite attractive. Ovary is superior i.e. situated at the summit of the flower and contains 1 to 4 compartments; style and stigma are single. Fruit is an ovoid capsule looking like a wheel above and opening at maturity by means of small apertures, all around this wheel like

structure. Seeds within the fruit are very many and small, almost minute in poppy.

In general the members of this family are narcotic, intoxicating, astringent, sleep inducing, emetic (i.e. inducing vomiting) and also purgative. The family consists of 28 genera and 600 species.

Besides poppy which we shall discuss in detail presently, some of the common plants of this family as available in India are as follows:

1. *Argemone mexicana*: or prickly popply is a recently introduced Mexican plant known as *satyananshi* or *peela datura* in Hindi. This is a very common weed available all over India. The whole plant abounds in a yellow glutinous milky fluid which is used to relieve blisters, heal excoriation (or superficial skin peeling) and indolent ulcers. It should however be seen that the juice should never come in contact with eyes. Its fresh root bruised and applied to the regions of scorpion sting confers quick relief.

2. *Dicenthra chrysantha* and *D. spectabilis* are both beautiful garden poppies quite common in many of our gardens. The former is called Golden Ear Drops in English because of its attractive pendulous golden flowers and the latter is known as a Bleeding Heart, as the flower here has a blood red spot. There is another species here called *D. choridalis* which has a bulb like structure that is used in nerve afflictions like paralysis. It has in addition some veterinary uses.

Names

Sanskrit calls poppy or opium by an interesting name viz. *ahiphena* which means the froth of a serpent or rather a mythical serpent - an *ahi*, a dragon as it were; the term *ahiphena* however mainly refers to the resinous secretion. It is also known as *khas khas, kasa bijam* (seeds), *kakasha* (also, seeds).

In English it is Opium, Poppy capsules, White poppy or Poppy seeds.

In Bengali it is called *posto dheri*; in Hindi, *posta, kahskhasa* (seeds) *sufed srah*; in Arabic, *navatul khas khas;* in Persian, *koknas, poste khaskhash* (fruits); in Gujarati *khaskhasna doda* (fruits); in Marathi *khaskhas che bonde* (fruits) or *afu* (the secretion); in Kannada *aphim* (secretion), *gasa gase* (seeds); in Telugu, *posta katol* (fruit); *gasu gasulu* (seeds); in Tamil, *gasha gasha* or *kasa kasa* (seeds), *abini* (secretion).

There is one variety called *lal posta* or red poppy or *Papaver rhoea.* This is known as *tambde khaskhas* or coppery *khaskhas* in Marathi.

In general, the secretion and the seeds, the two important parts of the plants tend to receive two separate names in the different languages.

Historical Note

Opium was a well known medicinal drug among the ancient Greek. Though it was likely that the

philosopher Socrates was not much aware of its qualities, his contemporary Rheagores the physician was fully aware of its properties as well as the actions. The latter had actually utilised it for many brain and nerve diseases. Extensive references for this drug occur in Arabic and Persian works. Zalinus, an ancient yunani physician gives a brief description of it. In 300 A.D. hakim Sau faristus refers opium as myconiyn. The Roman historian Pliny refers to it by the name opiyun. It is believed that the Arabs learnt the use of opium from the Greek. It is from Arabs in turn that the Iranians came to know of it. The famous ancient yunani authors like Shaikh Belicuna and Razi have given full descriptions of the use of opium. For China also, it was the Arabs who provided them with opium and its knowledge. Opium came to India only along with Islam. Neither the ancient Egyptians nor the ancient Indians had any knowledge of opium. There simply exists no reference to this plant in the ancient Sanskrit literature.

De Candole, a famous early European botanist opines that the opium yielding poppy or *Papaver somniferum* is probably the cultivated state of its truly wild form *P. setigerum*. It was the value of its seeds as food that was first recognised by man; The soporific and the narcotic use of the capsule was discovered much later but long before the recognition of the use of the milky sap. For instance, the capsules have been used to prepare soporific drugs or stimulating and soothing

beverages from very ancient times. Watt, points out in his dictionary of Economic plants of India that *P.somniferum* was grown in Asia Minor many centuries ago for its capsules and the Arabs carried this dried poppy heads eastwards including China even before the dried juice was taken and its properties known. The early Chinese works mentions the Arabs exchanging such poppy heads, with Chinese merchants. When Chinese were first shown these capsules, it reminded them of their own jar meant for storing millets because of its urn like shape and the presence of numerous small seeds. It was consequently called *minang* (millet vessel) and *gingsu* (jar millet). There are records to show that the Arabs instructed the Chinese to prepare from these capsules sedative beverages before they knew the use of the juice. Their word for opium i.e. *ya-pien* followed this term *minang*.

Poppy heads are not used in medicine now. But early history of medicine shows this to be the only way of use among the Greeks, the Romans and the Egyptians. Even in India the use of capsule was quite common at its initial stage of introduction. Even now hakims prescribe them for headache, dysentery, diarrhoea and digestive troubles in children. An infusion of the poppy heads forms a soothing application for bruises and also for inflamed, excoriated (where the skin has peeled off) and swollen parts. It is also used for various forms of conjunctivitis and inflammation of the ears. Fomentation with poppy heads is even now resorted to in cases of painful and inflammatory

swellings. In China also the capsules were freely employed medicinally in the early Christian era. Their use in dysentery is much extolled.

Poppy heads were used for their euphoric purposes (i.e. to create a sense of well being) in India soon after their introduction. The plant was known as *koknar*, the capsules were called *goze*, *khol-i-koknas*, *posta-i-koknas* or just *post* or *post-doda*. In the Mughal times, a beverage called *kuknas* prepared from these heads was a very popular drink. Abel Fazl records its use by the Emperor himself. A beverage called *post* is still taken in Punjab. Interestingly, Bontius, an European author of 1658 divides the Indians into two types: 'posti' those addicted to drinking *post* prepared from the capsules and 'afyuni' and those taking opium or the dried juice!

The earliest record of opium as in Indian product is that of Barbosa, in his description of the Malabar Coast in 1511 and the Portuguese historian, Pyres in his letter to king Immanuel in 1516.

There is some doubt as to whether the early Egyptians knew the use of opium or not. It looks very likely that it was the Greek who discovered the use of opium from poppy. The word *ophion* (is the Sanskrit *ahiphen* almost cognate to this word?) that occurs in Talmud, the sacred Texts of the Hebrews is clearly borrowed from the Greek. The Arabic word *Af-yun* has also the same origin. The original home of poppy has been Asia Minor no

doubt and it is from there that it was carried to the Greek. Homer and Livy, their historians knew the medicinal value of the plant and the botanist or rather the herbalist Dioscorides of first century A.D. describes the details of opium extraction.

By the beginning of the Christian era, opium and its properties had become universally known. Asia Minor was then its Centre of Cultivation where it had already reached the scale of an industry. This attracted the attention of the nomadic Arab traders who knew the secrets of its dissipative effects and spread the drug habit to the whole of the East, including India and China.

No reference to opium exists in ancient books on Indian Medicine. It is contended that in a work on poisons or Toxicology by one Narayanan of Malabar of A.D. 862, the use of opium in the treatment of rat poisons has been first mentioned. But in the later works of Bhavaprakash (sixteenth century) and Sharanga dhara (fourteenth century) opium is freely mentioned and used in several preparations.

Still however opium is not used to a great extent in Ayurvedic medicine at the present time. Its administration is just confined to two diseases viz. diarrhoea and dysentery and this is also resorted to, only in certain stages. It is no doubt said to cure the concurrent effect or *sannipata* effect of all the three *doshas* and also confer an increase in the seminal and muscular powers of man and to produce stupefaction of the brain. Very curiously

Ayurveda has not made use of the pain relieving properties of opium at all.

In the Yunani medicine however opium has been described as an anaesthetic and its pain relieving properties were also prescribed in onesided headache, pain in the joints and lumbago. It was prescribed in dysentery and diarrhoea. It was given internally and also applied externally as a paste. As regards its effect on brain, it was fully realised that it first gave rise to a feeling of pleasure, satisfaction, increased vigour and a sense of warmth; these however always resulted in a habit formation. Even the narcotic and the sedative effect of opium were recognised and utilised by them to secure relief in sever cough, asthma and hiccup. It was also reputed to prolong seminal retention and was thus a valued aphrodisiac.

Still however, it is important to know and remember that contrary to very popular belief, Kaviraj's and Hakims in India even now do not use opium and its products in their medicinal practices. Common people may therefore need not resort to its indiscriminate use as they are wont to, on such an assumed claim and actually do so, on the strength of such a belief.

History of Cultivation

Opium was cultivated so extensively in India during the times of the Mughals that it very soon occupied an important article of foreign trade with China and other Eastern countries. It was Malwa

opium that had acquired a great fame here. During the region of Akbar, its importance as a source of revenue to the King's treasury was first appreciated and it was he who made opium as a State monopoly forthwith. Ain i Akbari of Abul-Fazal clearly states that opium was extensively cultivated in Fatehpur, Allahabad and Ghazipur during those times - viz. mainly in certain regions of what is now Uttar Pradesh. Initially it was not grown in Bihar but soon when the revenue value was realised, this region also started its vast cultivation and this practice spread to other parts of the country also, to some extent in the South even. Quite soon during the Mughal times itself Bengal and Orissa had also become important Centres of poppy cultivation. However with the fall of Moghul Empire, the sovereign power of the State lost control on the monopoly on poppy and opium - over their production as well as sale. This function was soon appropriated by a ring of private merchants of Patna. This was however snatched away from them in 1757 by the machinations and the powers of the East India Company which had by that time relegated to itself the responsibility of collecting the revenues in Bengal and Bihar. When Warren Hastings became the Governor General he brought the whole of opium trade under Government control. Since then, despite some minor changes in the methods of control, of production, distribution, sale and even the mere possession of opium, the monopoly of all this has been strictly in the hands of the Government till today. There is an important change in the very

attitude however. Opium in the previous times was the concern of the Government of the day chiefly or solely because of the revenue which it was bringing. The concern now however is in the best interest of the health of the general public. Under the East India Company and later, under the British Crown itself, even the cultivation of poppy and the production of opium by the general public was prohibited. These were restricted to just three Centres (i) Patna or Bengal opium, from the fields of Bihar and Bengal (ii) Benares opium, from Uttar Pradesh and (iii) Malwa opium, from Rajputana, Gwalior, Bhopal and Baroda.

Modern science has made very explicit the miraculous medicinal value of opium as well as its horrendous deleterious effects. Naturally therefore opium production of modern times is a highly restricted and closely watched concern.

Medicinal Importance

Ayurveda considers the opium as being pungent in taste, hot in virility and bitter in post assimilation effect. It is presumed to destroy *kapha* aggravation.

Opium is mostly used to commit suicide; it is made into a mixture and drunk. Sleep sets in, soon becoming very dense; the victim becomes unconscious, his respiratory rate slows down, the face gets darkened, eyes become red, pupils get contracted, pulse becomes feeble, the body attains a coldness and finally death ensues.

Ayurveda mentions a method of purifying - i.e. a *shodhana* for opium. Very pure opium is taken and its is treated with the juice of fresh ginger twenty one times.

This is how opium poisoning is advised to be treated. A drug for inducing vomiting is to be first administered to such a patient by employing either *ritha* (soapnut or *Sapindus emarginatus*) water or hot water mixed with salt. Stomach is to be cleaned repeatedly by using a stomach pump. The patient of poison should not be allowed to sleep. He should be given hot and strong coffee repeatedly. He should also be given digitalin and strychinine by injection.

Opium plant has been of the most intensively studied medicinal plants of modern science. A brief idea of this vast information is sought to be given below.

There are two varieties of opium: One with black seeds and the other with white seeds. The latter yields a bitter oil which is white initially but soon becomes dark; this is somewhat bitter in taste and of an unpleasent odour. The seeds are white, grey or greyish black; they are sweetish and oily. In trade, there are three forms in India. Bihar and Bengal produce Patna or Bengal garden opium; Benares, Agra and Ayodhya produce Benares opium while the Central and Western India produce Malwa opium. It is the white flowered poppy that is grown mostly in India. The purple variety grows luxuriously in Rajasthan and Central

India. The red flowered variety with dark seeds is chiefly a Himalayan crop.

Parts of the plant that are used variously are: the nearly ripe and the dried capsules, petals, the dried juice and the seeds. As a drug, there are three varieties: white, purple and red - these have black or dark and white seeds and are called *Papaver nigrum and P.album.*

Constitution

Opium varies considerably in appearance, quality and composition depending upon its place of origin and the mode of its preparation. Patna opium has a large amount (7-8 or even 10 per cent) of morphia. Malwa opium is of many varieties in turn. The two major ones are: (a) one, occurring as flat circular cakes without any covering over it - this yields only 3-5 per cent morphia; (b) one, occurring as balls or smaller cakes and covered - this is superior and yields 7-8 per cent morphia. Apart from this morphia which is its characteristic substance, most varieties of opium also contain nicotine (the alkaloid of tobacco) half as abundantly. Seeds or *khaskhas* yield a large amount of a bland fixed oil known as Maw or poppy oil - of a pale golden colour and drying easily and agreeable in smell. Seeds are non bitter and are alkaloid free. But alkaloids exist in seedlings after about 14 days growth and this increases till the seedlings start storing albumen in turn. When the seed ripens the alkaloid content decreases as it gets used by the plant.

Opium or the inspisrated juice contains not less than 9.5 per cent anhydrous morphine. It also contains a very large number of alkaloids, 28 in number along with many organic acids and neutral substances. A few of the most important alkaloids are as follows: morphine (morphia) 5-9 per cent, narcotine 2-8 per cent, codeine 0.2-0.7 per cent, thebaine or paramorphine 0.15 to 4 per cent, cryptopine 0.08 to 0.5 per cent, pseudomorphine or oxymorphine 0.02 per cent, codamine 0.002 per cent, codamine 0.002 per cent and laudanine 0.01per cent. The others like laudanosine 0.0008 per cent, larthopine 0.008 per cent, groscopine 0.2 per cent and so on, are not so important, medicinally.

The organic acids are meconic acid 4 per cent, tactic acid 1.25 per cent and also acetic, sulphuric, citric and tartaric acids—these exist in combination with the alkaloids.

Opium also contains resins, a trace of volatile oil, glucose sugar, gum, albumin, pectin, cautchouc (what is found in chewing gum), wax, fat, colouring matter, odorous principles and 6 per cent ash containing salts of ammonium, calcium and magnesium.

The opium alkaloids are of two groups: phenanthrene—pycidine group comprising of morphine, pseudomorphine, neopine and thebaine and benzyl isoquinotine group consisting of papaverine, narcotine and most other remaining alkaloids. The members of the first group are

strong bases and very poisonous, the second group as a whole has very little physiological action on the human body. Opium value depends on the morphia percentage, this being the most important constituent.

Pharmacological Action

What is most interesting in opium action is to trace as to how it influences various mental facilities. These aspects are underlined in the account given herewith. Poppy seeds are demulcent (i.e. cooling and soothing) and also nutritive and mildly astringent (i.e. contractive and healing). Poppy capsules are astringent, sleep inducing, sedative and narcotice; *their use promotes talkativeness.* Externally they are used as an anodyne (a pain reliever) and emollient (a healing film). Opium is first a stimulant, then a narcotic and also an anodyne and an antispasmodic which counteracts involuntary contraction and expansion of the muscles. Simultaneously it is astringent and miotic (constricting of the pupil). In over doses it is a deadly enemy of every tiny cell of living body and *weakens the will power* of the individual. Locally it *relieves pain sensation* and allays spasms. As astringent, it checks bleeding, lessens body secretions and restrains tissue changes. Indian opium is now a very efficient substitute of the best Turkish opium as regards its medicinal value. It has an added advantage of being richer in codeine compared to opium of other countries.

The physiological effect of opium on the body is due to the combined effects of the alkaloids and the other principles. Given in a medicinal dose, it first *stimulates the brain*, the heart and the respiratory tract. This is followed by a *general depression* specially of the brain. *Its chief action is on the cerebrospinal system;* and *through the nerves it acts upon all the organs of the body.* It stimulates the generative organs; it affects all the secretions excepting that of milk and sweat both of which it increases by stimulating the mammary and the sweat glands. It causes a dryness of the mouth and throat and lessens the secretions of the stomach and thus comes in the way of appetite and digestion. It also diminishes bile secretion and causes constipation. It decreases the quantity of the urine secreted, increases heart action and also the tension of the arteries.

Initially *it generates an exhilaration of the cerebral functions*, then there is a sort of *mild intoxication*, to be followed by *a drowsiness and sound sleep* which is *however often disturbed by dreams*. This is usually followed on walking up by headache, constipation, indigestion and a *general depression of the spirits*. Large doses of opium depress the heart also, *lessen the activity as such of the brain cells, reduce the blood supply to the brain centres*, lower the blood circulation thus lessening the body heat and interfere with the very oxidation of the cells. The cerebral depression is succeeded by headache, dizziness and also slow and laboured respiration.

When the dosage of opium reaches a poisonous level the results are quite drastic. There ensues a stertorous or hard breathing with a wheezing sound to be followed by *coma or complete loss of sensation.* This is followed by slow and feeble pulsation, cold and clamy perspiration, contraction of the pupils to be followed as the end approaches by an abnormal dilatation, cyanosis or blackening of the fingers and the face and then by a total abolition of almost all natural reflexes. Then there is a deep coma, paralysis of the respiratory centres, carbonic acid accumulation in the blood and at the end of this envitable dramatic sequence of events, the final curtain of death.

Differential Action of the Alkaloids

We shall now see a little about the differences in the action of the diverse alkaloids present in the opium. Chemically they form two groups, mainly. One is the morphine group that includes morphine, codeine and thebaine and the other is the narcotic group that includes narcotine, narceine and papaverine. Most characteristically the opium alkaloids simultaneously *depress and excite the central nervous system* and in this respect there is some distinction among the two groups. All the five chief members morphine, papaverine, codeine, narcotine and thebaine exhibit this uniqueness. The narcotic action diminishes in the order of these alkaloids as given while the power of reflex stimulation increases until in thebaine a strychnine like effect is

exhibited. Morphia causes *stupor and sleep.* If morphia is taken when there is a pain, the part concerned becomes benumbed, and no *pain is felt* though the trouble remains all the same. Even small doses of morphine though inoccuous or harmless in themselves produce when combined with small quantities of subsidiary alkaloids, severe symptoms of poisoning. Apart from addiction, morphine habit does not produce any physical deterioration. The greatest increase in activity is obtained when equal parts of narcotine and morphine groups are combined and given. This is so as regards the overt perception of *even pain;* the combined dose is more effective. There is some evidence to say that the pain depressing activity is due to the subsidiary alkaloids, specially narcotine. This narcotine also possesses a counteracting effect to the depressing activity that morphine produces on the respiratory centre. It is because of such reasons, an useful conception has come about that even though narcotine itself is not very active therapeutically i.e. in effecting a cure, it has great possibilities of being a powerful curative agent when combined with other opium alkaloids in suitable proportions. This becomes a promising line of future research.

It has been stated above that morphine has both a *depressing and a stimulating action* simultaneously. On the Central nervous system; the former is produced mainly in the brain, and the latter in the spinal system. In man however the depressing action generally dominates the whole

nervous system. Respiration is slowed by morphine though in many cases it may be deeper at first though the amount of air taken per minute is actually reduced. Death by morphine ensues by its arrest of respiration. The alkaloid has little effect on circulation of the blood and also on the peripheral muscles and the nerves at the extremities. Pupil of the eye is much contacted by morphine poisoning until just before the final asphyxia, it gets very widely dilated. The alkaloid also causes a slight decrease in the body temperature, so that the body starts becoming somewhat cold. This morphine gets excreted in the body mainly by the digestive tract though its traces do occur in the urine.

Papaverine is a comparatively weaker poison. In the nature of its effect, it lies between morphine and codeine. It produces but a *light sleep* in comparatively small doses and this does not become deeper when the dose is increased. The reflex irritability is however increased and large doses may cause a tetanus like action. It tends to slow the action of the heart to a degree which is more than that of either morphine or codeine.

Codeine when given by itself has a feeble action but has a definite *sedative action in man.* In combination with other opium alkaloids however, it has as strong an effect as that of morphine. The other alkaloids have therefore a potentiative action on codeine; of these, narcotine has been seen to be the most important synergist or the helper.

Codeine resembles morphine in its general effect but its *depressing effect is less marked and less prolonged* and its stimulating action involves both the spinal cold and the lower parts of the brain. In small doses it *induces a sleep that is not so deep* as that of morphine while in large doses it *causes restlessness and increased reflex irritability rather than sleep.* The respiration is also slowed to a lesser degree. The pupil is first contracted and then dilated at the excitement stage of intoxication.

The chief value of narcotine is that it is a good synergist and increases the toxicity of both morphine and codeine. Its synergism with morphine extends to the latter's action of the central nervous system also. Narcotine generally resembles codeine in action but is *less* depressant. It is less poisonous than either morphine or codeine. At one time this was much used in India in treating migraine (headache) as an analgesic or a pain reliever and also for malaria. But this has been long superceded by quinine for malaria. Narcotine does not seem to have been much used in medicine so far. It definitely inhibits the peristaltic or the involuntary contraction - expansion of the alimentary canal. When given intravenously it relaxes the involuntary musculature all over the body—for example, of the bladder, the uterus, the gall bladder and so on. Unlike morphine, narcotine *stimulates the respiratory centre in the medulla of the brain.* It has *a depressant action of the pain areas of the brain* and as such, lessens headache, *pain in the limbs,*

discomfort and so on that accompany feverish states. Its undoubted action as noted above is that it enhances the individual action of morphine and codeine, so that much smaller quantities of these alkaloids would be effective if given in combination with narcotine. In toxic doses, narcotine stimulates salivation greatly but does not influence urine, sweat etc at all. Narcotine is not a very toxic alkaloid in fine. Narcotine is recommended as a *hypnotic drug* but is believed to have but little effect when pure. This is probably because its salts are instable and the alkaloid itself is insoluble.

Let us see now about the derivatives of the opium alkaloids.

Of these, two are important. These are apomorphine and stypticin (which is cotarine hydrochloride chemically). When morphine is converted into apomorphine its depressant action on the Central nervous system is almost wholly lost but the stimulant action remains and is exercised over the whole of the central nervous system, specially on the medulla. In very small doses apomorphine does not produce any vomiting. Stypticin is used in medicine as a styptic (i.e. contractive) and in all forms of uterine haemorrhage and also for checking excessive menstruation. It is also employed as a 5 per cent ointment in treating *visarpa* or erysipelas, eczema and shingles. This is available in the market as tablets. Stypticin wool and gauze (30 per cent) are also in active use.

formation. Opium given in this way can also be effectively used to detect malingering or merely pretending as if they have an illness which many "patients" actually indulge in.

The quickest and the shortest method of treating the addict is to bring about an abrupt withdrawal. The advantages are : the time involved is just 3 days. After this short period the undesirable mental effect on the addict is found to be absent. This procedure also avoids complicated and prolonged medication. However this method is not suitable to all addicts and it also suffers from important disadvantages. The latter are: immediately after such a drastic withdrawal, the addict may suffer from prostration, collapse or may even die.

A gradual withdrawal is therefore attempted in many cases. This is quite safe and totally avoids the risks of protraction, collapse and sudden death. The disadvantages are: the absence of the desirable psychological effect, the need for prolonged vigilance, lack of certainty of the cure effected and most importantly this can be resorted to, only when the patient is under careful surveillance as in a nursing home, sanatorium or a jail.

The third procedure is called a substitution method. This is carried out by using sedative drugs as substitutes. Some examples are luminal, chroral, intravenous magnesium sulphate and so on. Or, a pill containing opium, nux vomica,

gentian and pepper can also be an effective substitute for the morning dose; there is no interfering with the evening dose at all. This will avoid insomnia or sleeplessness which will prevail otherwise.

In India sudden withdrawal is advised only in those addicts who take less than 3 grains of opium a day. For children, sudden withdrawal is usually followed, but this will result in diarrhoea, nausea and general irritability, which however can be safely treated by appropriate drugs.

Opium as a Medicine

Ayurveda and Siddha system consider opium as having pungent and astringent taste and a property of overcoming *kapha* and *vata* aggravations, besides being a strengthening and an aphrodisiac substance. The resin has a pungent taste, a hot potency, and is dry in quality; it can overcome the aggravation of all the three *doshas*, provokes digestive fire and is an intoxicant and is useful in cough.

Yunani physicians regard the poppy seeds as cold 2°, moist 1° (the white); cold, 3° and dry 2° (the black). The white seeds are hypnotic and toxic to the brain, while the black seeds are useful in liver complaints, diarrhoea and the white discharge.

For medicinal purposes, many preparations are made from the poppy plant. They are: oil of the poppy seeds; fresh syrup (1 in 2, 1/2 water, or 1/2 spirit and 1, 1/2 sugar), decoction (1 in 15 parts

of water) and poultice—all of these from poppy heads or capsules; extract (1 in 3 or 4 parts of water and 1/2 part of spirit), pills, tinctures, compound powders, plasters and ointments - all of these, from opium. Morphine or morphia produced from the opium occurs as a white amorphous powder or as shining, transparent and needle like prisms.

An important information here is that the familiar potassium permangenate has a very unusual property of being incompatible to opium. It is able to oxidise it and so destroy the medicinal as well as the poisonous properties of an equal weight of opium. The other such incompatible substances are: alkalies, alkaline earths (*ksharas*) and also the substances that contain tannin and salts of lead, iron, copper, mercury and zinc and also the arsenical liquors.

Medicinal uses of poppy are quite varied.

The seeds yield a bland fixed oil which is eaten and used as a cooling medium.

It is used medicinally much like the soothing olive oil in doses of 1/2 to 1 drachm. Seeds are completely harmless and are used as a food to be sprinkled on sweetmeats or made into *kheer* or used in confectionaries. They are also boiled, mixed with some oil and salt and taken as curry with rice or made into balls and shaped with tamarind as a soury curry. As a mild astringent they are given with sugar and cadamoms; they are

also beneficially given in dysentery and diarrhoea. Poppy seeds and lettuce seeds, 2 and 1 parts respectively, are soaked in water, the mucilage extracted, mixed with sugar and given in insomnia.

Hakims prescribe poppy capsules by themselves or along with astringent drugs for headache, diarrhoea, dysentery and digestive troubles in children. Giving them to children at the time of teething is a household remedy in India. Ancient Chinese writers like Wang Shih have considered that the effect of these capsules in dysentery was just magical.

Bruised capsules act as a soothing application to irritable ulcers as well as painful conjunctivities, opthalmia, inflammation at the ears and so on. Their decoction is given as a soothing injection to uterine cancer. To be used for fomentation they should be broken up and boiled in water and the resultant hot decoction alone is to be employed. Such a fomentation is beneficial to sprains and contusions.

Opium itself is given in diarrohea, dysentery, sleeplessness, colicy or twisting pains of the stomach, intestinal and inflammatory pains, as well as severe, spasmodic cough, asthma and hiccup. It is useful in fever, specially in the latter's violent stages or exacerbation. It is also beneficial to support the residual strength of the patient and to calm down the exhausted nervous system.

Opium is used in combination with other drugs in treating diabetes mellitus. It is highly beneficial in reviving the flagging nervous system in the violence of such diseases as typhus fever, small pox, typhoid fever and in low muttering delirium accompanied with twitching or convulsive movements and restless tossing about. In cases of fever with violent delirium, wakefulness, suffused and swollen eyes and constant getting up from the bed, opium given in combination with aconite (*atis* in Hindi) renders the patient dramatically tranquil and also induces sound sleep.

Since opium as a medicine always involves considerable amount of risk and judicious care is indispensable here, it is necessary to note the following points always: (a) Giving opium should be wholly avoided under the circumstances as follows: if there is any doubt whatsoever, as to whether it should be given at all or not in any specific situation; for persons who are intolerant to opium - even the smallest doses produce in them violent headache and vomiting as well as great nervous excitement; for infants and children who can tolerate opium only very badly (in general, opium should be given to children only under expert medical supervision); for pregnant women, as, opium is likely to expel the foetus; for persons suffering from diseases of the kidney specially if there is a tendency to dropsy and Bright's disease; for cases of strongly marked contraction of the pupils, inflammatory and other diseases where the tendency to death is by coma or by apnoea (or,

cessation of breath) rather than by asthma; in congestion of the brain as shown by suffused eyes and contracted pupils; if the bronchi are filled with excessive, thick and viscid phlegm; and in heart patients. In excessive excitements as in menengites or mania following child birth and insanity, opium as a medicine should not be continued for a long time as this would derange digestion and secretion. In consumption or pthisis also opium medication should not be prolonged. At the beginning or during the height of fever where a dry tongue prevails, opium should be totally avoided.

Hakims recommend it as an effective aphrodisiac but it is important to note that the drug after temporary stimulation actually diminishes sexual desire and causes impotency.

A simple opium liniment or thin ointment can be made by rubbing a drachm of opium in 2 ounces of coconut, til or any bland oil. This is very useful in many external or local diseases such as chronic rheumatism, lumbago, muscular and neuralgic pains, spasms and bruises, enlarged glands and mumps. Adding a small quantity of camphor to the liniment increases its efficiency greatly. Such a camphorated opium liniment proves to be an excellent medication for many painful external afflictions. But this should always be well shaken before use and should not be applied on abraded or sore surface i.e. where there is an injury to the skin and the internal tissues are thereby exposed. Even when the skin is unharmed, the liniment

should still be avoided if the pain is accompanied with redness and heat. Rubbing this along the spine is often very useful in whooping cough.

In opthalmia attended with great intolerance to light, fumigating the eye with the vapour of boiling water containing a teaspoonful of laudanum (i.e. tincture of opium) or a couple of grains of opium will confer a great relief. An excellent eye wash here is made up of laudanum, vinegar and brandy (each 1 part and water 4 parts). Tooth ache due to decayed tooth is often relieved by a grain of opium placed in the hollow of the tooth, but care should be taken not to swallow the saliva. Ear-ache also responds well to a mixture of laudanum and any bland oil mixed in equal proportion and inserted into the outer part of the ear passage on a cotton wool; but, again care should be taken not to press this plug too far inside. To the piles that are paining too much and also accompanied with much swelling and heat, a very soothing application is to make a soft rice poultice sprinkled over with laudanum or smeared over with opium liniment.

Cold pressed oil from the seeds is a good table oil or a cooking oil. The darker coloured oil is used in Europe to be converted into soap.

Economics of Opium

The crucial role that opium occupies in modern medicine can scarcely be over emphasised. This is solely due to the alkaloids in it, but, of the several

such alkaloids present in the crude resin th constitutes opium, the five important ones a morphine, codeine, thebaine, narcotine an papaverine. Indian opium on dry basis contains to 14 per cent morphine, 2.5 to 3.5 per cen codeine, 1 to 2 per cent thebaine, 5.5 to 7.5 pe cent narcotine and 0.1 to 0.8 per cent papaverine. Many pharmaceutical preparations of opium are manufactured in India. Some of them are: medicinal opium, opium alkaloids, semi-synthetic derivatives and their salts. Morphine, codeine and thebaine are commercially recognised narcotics and their production as well as sale are strictly controlled by Governmental regulations.

Of all these, morphine is the most valued drug almost irreplaceable in its wonderful capacity of removing agonizing pain and conferring deep sleep. Because of this reason, it is considered a strategic material in war and peace and in modern atomic warfare, opium and morphine are directly needed to eradicate the pain of the victim of radio active fall-out of nuclear explosion. Codeine comes next in value as a mild analgesic - i.e. pain killer but acting simultaneously as an anti tussive drug (e.g. cough preventing). It is prevalently employed in giving relief in headache, tooth ache, body pain, nervous diarrhoea and irritating dry cough. It is important to note that since morphine is an addiction producing drug, it is not more than just one per cent of it that enters into the pharmaceutical sales. On the contrary, nearly 90 per cent of the morphine produced in the World is

semisynthetically converted into codeine. Thebaine is not used directly in medicine. This is used to make naloxene, a drug employed to sedate the wild animals and capture them alive. There is a good demand for thebaine in Japan, France and other countries in Europe. Narcotine is used as an anti-tussive drug in wet cough, bronchial asthma and pulmonary emphysema (loss of lung function due to the destruction of air sacs). Papaverine is used as an anti-spasmodic and also as a vasodilator (expanding the blood vessels) so as to relieve pain in coronary and cerebral thrombosis viz. clotting of blood and thus blocking further blood supply beyond the region of the clot as it takes place in the arteries supplying the heart, or, in the blood capillaries of the brain, respectively; or, in many heart failures and cerebral paralysis. Papaverin also affords relief in asthma. There is an important further derivative drug papaveratum BPC which is a mixture of hydrochlorides of morphine, codeine, narcotene and papaverin. This is used as a sedative (sleep inducer) and analgesic (pain reliever) when labour pain becomes unbearable and prolonged. The entire requirement of papaverine in India is now imported from abroad.

A Relook at Morphine

Pain is so universal and an important concern of the physician and its intolerable excess always needs an urgent attendance. There is nothing like morphine, the most important alkaloid of the

poppy plant in bringing this about and there lies the great value of morphine and its derivative drugs. Because of their sheer importance, a relook about them becomes necessary by way of a summary as well as to afford an useful overview.

At present in the medical world morphine is the most generally used and highly effective pain killer. It not only eliminates pain but also allows one to tolerate pain, namely, the sensation is felt alright but it is no longer unpleasant! As noted above, it exercises two types of opposite reactions on the central nervous system; it depresses it as well as stimulates it. Its employment is followed very soon by a state of relaxation as well as a mental tranquility, a detachment and well being or euphoria as it is called technically or occasionally however, an opposite reaction viz. that of unpleasantness or ill being. This is also accompanied with sleepiness, inability to concentrate and a general laziness and lack of interest. However this state of pleasantness should not be disturbed by vomiting and nausea which are quite common if the patient is walking about and not bed ridden.

It can be said in general that morphine has a useful hypnotic effect and a tranquilising reaction on the body and as such it can be given without hesitation in full dose in circumstances where it is called for, for instance in cases of acute pain and fear, as in myocardial infarction or heart attack and traffic accidents.

Morphine gives a great relief in emergency cases of highly upsetting breathing difficulties that appear in the night, in bouts or paraxysms; or the sudden distress of heart attack, or any type of unbearable respiratory distress. It allays the respiratory distress by rendering the respiratory centres in the brain insensitive to the stimulii received from the lungs.

Codeine is a locally efficacious ally of morphine. It cannot control pain and most of its other actions are about one tenth that of morphine in efficiency. An important difference is that if this is given in large doses it causes excitement. The feeling of dependence viz. the feeling that the patient develops of not being able to do without it once its treatment has commenced as it takes place when morphine is used as a drug, takes place here also. But, such a dependence is much less with codeine than with morphine. The chief use of codeine is in treating mild and moderate pain and also cough. But if this is used on a long term basis, it results in chronic constipation. Another use of codeine is in reducing the symptoms of milder diarrhoea. There are many formulation in pharmaceutics where codeine forms an important ingredient of cough treatment (cough mixtures) and for pain in which it is commonly combined with aspirin. Their common names are aspirin, paracetamol and codein tablets.

Pethadine is another morphine like drug that was discovered recently and introduced in

medicine in 1839. This was discovered when a search was being made to find out drugs that could relax smooth muscles acting like atropine. When given to mice for testing, it caused the tail to stand erect! This is a characteristic effect of morphine like drugs which they bring about by the spasm (or sudden contraction) of the anal sphinctre or the ring like muscles at the anal aperture. It was this phenomenon that attracted the attention of the researchers to examine the pain killing effect of pethidine further. It is now known that pethedine cannot relieve such severe pain as a morphine does, but it is definitely effective against pains that are beyond the reach of codeine.

Of all the derivated drugs produced from morphin there is nothing more notorious as diamorphin - or heroin, as it is more popularly called. This is a semisynthetic drug first made from morphine at St. Mary's Hospital in London in 1874. It was introduced in 1898 as a remedy for cough and also for treating the victims of morphine addiction, for both of which purposes it is really quite effective. Such a "Medical Use" of the heroin did continue for some years. However it soon became clear that heroin cured morphine addicts in a rather strange way - this is by causing an addiction for itself in these unfortunate patients! This became really a case of jumping from frying pan into the fire itself as far as the addict is concerned. Instead of being morphine addicts the poor victims became heroin addicts—a much worse

affair. Ever since this medical accident, heroin has become a very popular and infact, the most popular opoid drug, actually, *the drug* for the addicts. It has achieved such a "reputation" in this field that it is difficult now to ascertain whether the addicts are attracted to it because it is pleasanter or because of its sheer such a reputation aided of course by its ready availability due to an almost international "collaboration" of drug peddlers and smugglers. This drug is rapidly i.e. within just a few minutes converted into morphine in the body.

Heroin is the most potent of all dependence—producing agents; once a victim becomes its slave he can hardly leave it till he dies. Weight for weight this is certainly more potent than morphine. And, this is of great importance to the traders and the smugglers because it occupies less space in transport!

It is because of these reasons that, in almost every country now, the manufacture of heroin even for its use in medicine is officially declared as illegal. The very first country which attempted such a prohibition by legislation was the United States of America. This was done as early as in 1924 itself as it was provoked to do so by the magnitude of the addiction problem in its society. It speaks volumes for the tenacity of the drug traders to know that heroin suppression still continues to be a menacing problem for USA inspite of all this and infact the magnitude of the offence is reaching ever increasing proportions since then! An effort was

made in 1953 to achieve a world wide ba
heroin in medicine so that any heroin whe
found became automatically illegal. Most coun
agreed through United Kingdom did not do
because legitimate supplies for medicine were
then getting into illicit channels then!

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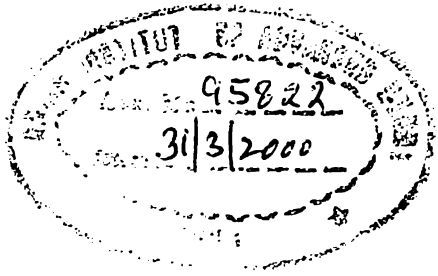

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