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Your Cup of Tea

A consignment of Darjeeling gold brand of tea exported to Germany by Indian market leader Teekanne in 1995 was rejected because the tea leaves contained excessive quantities of banned pesticides. The tea leaves apparently contained the pesticides – tetradifon and ethion in quantities much greater than the MRL's set by Germany. MRL or Maximum Residue Level indicates the maximum concentration of pesticides permitted in foodstuffs by any country. Incidentally, the MRL's set by different countries for the same pesticide varies drastically. For example, the rejected consignment of tea contained 0.24 mgs of tetradifon per kg of tea. This was 24 times the MRL fixed by Germany. The argument of our Indian exporters was that the MRL set by the US Environmental Protection Agency was 8mg/kg. It is interesting to note that the main producer of tetradifon in India was a German manufacturer who sold it under the brand name of Tidion. This product was banned in India in 1992. Though it is seven years since this ban, we have not yet set any domestic standards for MRL of pesticides in tea nor have we made an effort to curb unfair trade practices. We are still susceptible to non-tariff trade barriers and unfair practices of developed nations.

The market access of products from developing countries is adversely affected by the domestic environmental policies of developed nations. Developing nations often lack the technical and financial ability to comply with these stringent laws. It is widely believed that the 1995 German ban was protectionist. The Codex Alimentarius Commission is the international standard setting body for fixing technical specifications and benchmarks for all agricultural commodities including tea. Though Codex cannot impose its standards on all countries, those which adhere to its guidelines automatically conform to international trade rules. However, Codex which is recognised by the WTO (World Trade Organisation) has not yet set a standard for tetradifon. The cost of testing tea for pesticide residues is US $ 200 per sample which is prohibitive in Germany and amounts to non-trade barriers. It is also thought that the MRL's set by Germany were arbitrarily imposed because of lack of data from India on its pesticide safety limits.

The fact that tetradifon was detected in tea three years after it was banned in India shows the poor enforcement regime in our country.

Though several agreements exist to safeguard the business interests of developing countries, regulations of this nature are potential trade barriers.

The estimation of MRL involves a complicated procedure which requires ample data from different agro-ecosystems. The residue data from analysed samples is evaluated by experts and an MRL is recommended which is consistent with national good agricultural practices (GAPs).

The amount of pesticide residues that can be daily consumed on a long-term basis without causing harm is called the acceptable daily intake (ADI). This value is determined based on experiments conducted in animals. If toxicological studies are insufficient and there is lack of sufficient data on pesticide residue levels to determine ADI, then MRL values are set based on temporary acceptable daily intake (TADI). In such cases, the application of safety factor is larger than that used in estimating an ADI.

Under such circumstances, Germany applied a default value based on the limit of determination for the pesticide. This is the lowest level of the pesticide residue that can be detected, quantified and confirmed in the product and is called 'zero' tolerance. Even if a miniscule amount of the presticide is used, it is impossible to maintain these levels.

Tea is the second most consumed beverage after water and about one and a half billion cups of tea is consumed daily all over the world. The tea crop is attacked by a variety of pests which multiply rapidly and cultivators apply a combination of several types of pesticides over larger areas to combat these pests.

The MRLs for tea are based either on the toxicity level of active ingredients of the pesticide or on the field data generated in different tea producing countries.

Codex has set the MRL's for only some pesticides in tea. So, countries set their own standards that are more stringent. In accordance with a European Council directive, Germany set the MRL for ethion in tea at 2mg/kg in 1994. The order stated that only a temporary MRL could be fixed due to insufficient data. On the other hand, EPA applied an MRL of 10 mg/kg for ethion in tea whereas Codex stipulated a level of 5 mg/kg. Though Germany adopted a lower limit than other countries, it was approximately of the same order of magnitude.

Such wide differences in MRL's provoke controversial issues. It is alleged that Germany buys Indian tea in bulk at low prices quoting the pesticide contamination, then processes it and sells at higher prices. It is also widely believed that the standards set by Germany are not based on scientific evidence.

A meeting of the intergovernmental group on tea was held under the aegis of FAO in New Delhi in October 2001 to address these issues. Some countries set MRL standards based on the 'minimum detection limits' rather than on scientific data. Further, the wide variation in MRLs applied by importing nations is a potential deterrent to trade. To resolve these issues, the panel proposed to fix unified global MRLs and submit them to Codex.

In India, we have done the groundwork for providing a broad base for fixing MRLs for the entire range of pesticides used in our country. However, this is yet to be recognised officially. Extensive field trials have been conducted at Kolkata, Coimbatore and Palampur. An expert committee of scientists have developed a national protocol for harmonising the MRL's formulated within the country with those prevalent at the global level. At present, MRL's have been fixed for 14 pesticides and further experiments are conducted for 12 other compounds. These standards will be tougher than those of Codex.

Currently, the production of tea in India conforms to standards set by Prevention of Food Adulteration (PFA) Act which includes water, ash and crude fibre content in tea but not pesticide residues.

Trade restrictions form a major hurdle for export of agricultural products from developing countries to European markets. The basic task at hand is to improve the pest management practices of

farmers apart from enforcement of regulations. Further, the cost of commercial testing of tea is at an exorbitant cost of Rs.3500 per sample.

Tea cultivators feel that the best way to combat this problem is to go in for organic and biodynamic cultivation. At present, India accounts for nearly 90% of organic tea produced worldwide. On the contrary, only about half of India's organic tea estates make profits.

Source : Down to Earth, April 15, 2002
Compilation – H. Saraswathy

Samba Mosanam paddy variety – ideal for waterlogged fields

Earhead of Samba Mosanam

Mr. Ranganathan who is a farmer belonging to Mangalam village of Tirukazhukundram block of Kancheepuram district has 2 acres of land adjoining a lake. Out of these two acres, half an acre of land remains submerged in water during monsoon season. This resulted in crop losses when high yielding paddy varieties were cultivated. So, Mr. Ranganathan cultivated Samba Mosanam variety of paddy during the last July – November season by direct sowing.

Since there was heavy rain last year, the water level in the lake was higher than usual. There was about 4 ½ feet of water stagnation in about half an acre of his land. The stalks of Samba Mosanam paddy variety remained unaffected and withstood the waterlogged conditions. However, the stalks of high yielding paddy varieties like Ponni cultivated by the neighbouring farmers were bent and remained submerged in water. This caused germination of the grains resulting in crop loss.

In waterlogged conditions, wherever Samba Mosanam was cultivated, there was no loss in yield. This has motivated the neighbouring farmers to cultivate this variety during the next season.

Special Features of this Variety

1. This variety is also called Puzhudikal, Eri nel and Maduvu muzhungi in Tamil. It is suitable for cultivation in the vicinity of lakes. It is said that people travelled by boats and harvested the 'Samba Mosanam' in the lakes.

2. This variety is good for preparing aval (flattened rice), idly and dosa.

— K. Subramanian

Management of pest and diseases in Field Bean

There was a high incidence of pests and diseases in the Field Beans cultivated in the CIKS farm at Anjur during the last season. The general pests and diseases attacking this vegetable crop and the methods of control are detailed below :-

1. Pod borer

These insects bore into the flowers and fruits thereby causing extensive damage. They eat the seeds inside the fruits. So, the market value of the vegetables are affected.

2. Pod sucking bug

These insects are purple-grey in colour. They bore into the pods and suck the sap from the seeds. Black spots appear on the infested pod. The affected pods wither away before attaining maturity. Heavy losses have been reported due to attack of this bug.

Control of pests

These pests were controlled by spraying 5% extract of *Andrographis paniculata* using a low volume hand sprayer.

Preparation of *Andrographis paniculata* extract :

One kg of the entire plant (the leaves, stem and roots) was taken and boiled with 4 litres of water for about 3 hours till the quantity was reduced to 1 litre. This extract was filtered and sprayed on the plants.

Cercospora Leaf Spot

Red spots appear on the upper surface of the leaves. The number of spots increases gradually covering the entire leaf surface. Gradually, the leaves wither. This fungal disease affected nearly 50% of the leaves.

Management

One litre of cow's urine was mixed with nine litres of water and sprayed by a low volume hand sprayer. This was effective in controlling the leaf spot.

Growth Promoter

'Panchagavya' was sprayed on the plants to promote growth and to aid in flowering and fruiting.

Preparation of Panchagavya

Cow's milk	-	300 ml
Cow dung	-	500 gms (mixed with 500 ml of water)
Ghee	-	100 gms
Curd	-	300 ml
Coconut water	-	400 ml
Sugarcane juice	-	400 ml
Yellow plantain	-	2 nos.

All the above mentioned products were placed in a wide mouthed mud pot, mixed well and kept open for 6 days. The contents were stirred well with a stick everyday.

After 6 days, 300 ml of the prepared Panchagavya was mixed with 10 litres of water and sprayed using the low volume hand sprayer. Flowering and fruiting increased substantially after a week's time.

Aphids

On the fourth day after spraying Panchagavya, there was aphid attack on the crops. Aphids infected the flowers and fruits and young leaves. Flowers started withering due to sucking of sap.

Control

5% neem kernel extract was sprayed which helped in complete control of the aphids.

— M. Jayashankar, S. Manikandan & S. Thambidurai

Newsline

The Killing Fields of Warangal

During the cotton growing season from July to January 2002, large scale deaths were widely reported all over Andhra Pradesh especially in the Warangal district. Toxics Link had undertaken a detailed investigation of this issue along with organisations like Centre for Resource Education, Sarvodaya Youth Organisation and Community Health Cell . They have published a report in January 2002 based on detailed field investigations in the affected district. Investigations revealed that a majority of those affected by pesticide exposure were farm labourers or marginal farmers who were economically insecure. Farmers from 6 villages were interviewed. Symptoms of pesticide poisoning were recorded as also the reports of private and government medical practitioners. The agricultural practices of the victims especially the methods of handling and spraying pesticides were observed in detail. Basic data regarding the pesticides commonly used and also their toxicity profile have been reported. Copies of this report can be had from Toxics Link, Chennai. Email : tlchennai@vsnl.net

"The ecological discourse about planet earth, global hunger, threats to life, urges us to look down at the soil, humbly, as philosophers. We stand on soil, not on earth. From soil we come, and to soil we bequeath our excrements and remains…. Our generation has lost its grounding in both soil and virtue.

– Ivan Illich

Developing Nations – Dumping Grounds of US?

A study recently conducted by the Foundation for Advancements in Science and Education (FASE) indicates that US has exported about 29,484 tonnes of banned or restricted pesticides to the developing world between 1997 and 2000. During the period April – September 2001, the US exported chemicals worth approximately Rs. 578 crore to India. The results of the study was published recently in the International Journal of Occupational and Environmental Health (IJOEH).

The editor of this journal, Mr. Joe LaDou feels that these issues should draw more attention in the developing countries which should initiate research about the environmental health hazards of pesticides. The export of banned and unregistered pesticides from the US should be prohibited. Besides this, the Environmental Protection Agency (EPA) should evaluate the toxic effects of chemicals exiting the US and information divulged on pesticides should be improved.

According to Mr. Carl Smith, Vice President of FASE, recent international efforts like the PIC (prior informed consent) and POPS (persistent organic pollutants) treaties have made a difference due to which there was no export of banned pesticides from US in 2000. But it is a fact that there is a high export of products that are unsafe for developing countries.

According to the PIC treaty, the US has to inform Indian importers about the status of exported pesticides in their country. However, America can export pesticides (which is banned in their country) to India provided its usage is still permitted in India. In India, the usage of pesticides is governed by the Insecticides Act of 1968, which is reviewed from time to time.

Source : Down to Earth, February 15, 2002

Control of Panama Wilt

Mr. Narayanasamy fumigating his banana field

CIKS conducts Trainers' Training Programme for farmers once a month regularly. Mr. Narayanaswamy of Thimmavaram village of Kanchipuram district who owns six acres of land is a participant of these workshops. He cultivates banana in one acre of land.

He found the leaves of young banana plants turning yellow in colour and withering. Such a condition occurs due to the incidence of 'Panama Wilt' which is a fungal disease. He used the following treatment method for controlling this disease.

Substances required :

1. Fruits of ***Embelia ribes*** - 200 gms
2. Sweet flag ***(Acorus calamus)*** – 500 gms
3. Cow's urine – 500 ml
4. Khadi soap extract

Fumigation

200 gms of ***Embelia ribes*** fruits were powdered well and the banana fields were fumigated with this smoke in the evening around 6 O'clock.

Sweet flag and cow's urine extract

4 days after fumigation an extract of sweet flag and cow's urine was sprayed. 500 gms of sweet flag was powdered and soaked in 3 litres of water. This extract was then filtered. 500 ml of it was mixed with 500 ml of cow's urine and 100 ml of khadi soap extract per tank and sprayed. This spraying was again repeated after two weeks.

— S.Manikandan and S. Thambidurai

To promote fruiting in Bottle gourd

Mrs. Lakshmi of Venpakkam village in Kancheepuram district has been cultivating snake gourd, pumpkin, beans, bottlegourd, ribbed gourd, bitter gourd etc. in her kitchen garden. CIKS supplies indigenous varieties of these vegetables to women farmers like her. During the last season, she found that there was no fruiting in bottlegourd. To promote fruiting, she fried 100 gms of asafoetida and powdered it. She mixed it with 1 kg of farm yard manure. This manure was applied around the plants at a depth of half a foot and watered well. This promoted flowering and fruiting ten days after application.

– S. Manikandan

Cost of cultivation of Thooyamallee

Mr. Chellamuthu of Alavai village owns seven acres of land. During the last July to November season, he cultivated an indigenous paddy variety called Thooyamallee procured from the CIKS seed bank in 43 cents of land. He also cultivated ADT-43 paddy variety in 3 ½ acres. Detailed below is a comparison of the cost of cultivation of the organically cultivated indigenous variety and the high yielding variety which was chemically cultivated.

Cost of cultivation	**Thooyamallee (in 43 cents)**	**ADT-43 (in 3½ acres)**
Method of cultivation	By transplantation	By transplantation
1. Cost of preparation of nursery	Rs.100.00	Rs.600.00
2. Cost of seeds	20 kgs x Rs.8 = Rs.160.00	105 kgs x Rs.11.60 = Rs.1218.00
3. Cost of preparing the field	ploughing the field 4 times = Rs.400.00	ploughing the field 4 times = Rs.4500.00
4. Transplanting	To pluck seedlings = Rs.75.00 For transplanting = Rs. 200.00	To pluck seedlings = Rs.1,350.00 For transplanting = Rs. 1,750.00
5. Application of manure		
i. Basal manure	Farmyard manure- 2 cartloads = Rs.250.00	40 bundles of greenleaf manure = Rs.1,000.00
ii. Top dressing	30 kgs of Neem cake and cost of application = Rs. 375.00	a) D.A.P – 4 bags (Diammonium Phosphate) b) Urea 3 bags c) Potash 6 bags d) Ammonium Chloride 3 bags + cost of application = Rs.4,480.00
6. Crop protection measures	No pest, disease attack.	For control of Leaf folder Cost of pesticides + cost of application = Rs.1,366.00.

		To control blast disease Cost of pesticides + cost of application = Rs.1,275.00 To control Earhead bug Cost of pesticides + cost of spraying = Rs.1,015.00
7. Harvest	Labour cost for 8 men for harvesting = Rs.585.00	Cost of harvest by machines = Rs.4,400.00
8. Yield	Paddy yield 575 kgs x Rs.6.50 = Rs.3,737.50 Hay 1000 kgs x Re.1.00 = Rs.1,000.00	Paddy yield 3900 kgs x Rs.6.00 = Rs.23,400.00 Hay 2500 kgs x Re.1.00 = Rs.2,500.00 (About half the quantity of hay was lost due to machine harvesting)
	Total Income = Rs.4,737.50	**Total Income = Rs.25,900.00**
	Total cost of cultivation = Rs.2,145.00	**Total cost of cultivation = Rs. 22,954.00**
	Net profit = Rs.2,592.50	**Net profit = Rs.2,946.00**

Special characteristics of Thooyamallee

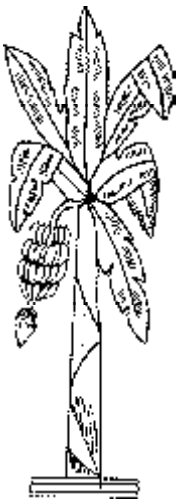
Thooyamallee is a fine variety of rice suitable for the South Indian meals. It is ideal for making special dishes like "Biriyani". In Tamil Thooyamallee literally means pure jasmine. Since the rice of this variety is white in colour like that of jasmine it is known by this name.

Mr. Chellamuthu obtained a good profit at a low cost of cultivation. Thooyamallee was found to be resistant to blast disease. He obtained a net profit of Rs.2592.50 by cultivating Thooyamallee in just 43 cents. Whereas, the net profit by cultivating ADT-43 in 3½ acres was only Rs.2946/-.

Farmers of Kancheepuram district had cultivated the high yielding ADT-43 variety of paddy covering almost 100 acres of land during the last season. There was heavy loss in crop yield since this variety was heavily infested by blast disease. On the contrary, Thooyamallee variety showed good resistance to blast disease. Hence many farmers have decided to cultivate this indigenous paddy variety during the next season.

— K. Subramanian

Termite control using natural products



An experiment to control termites using juice from the banana tree - *Musa paradisiaca* was done at our Anjur field. The leaves, leaf sheath and stem of the banana tree were ground to extract the juice. Freshly extracted juice, juice fermented for 24 hours were used for the test. The juice extracts were also tested at concentrations of 5%, 10%, 25%, 50% and 100%. Wood pieces, coconut fronds, wooden frame work of pandals, wooden pillars and sacks which are easily attacked by termites were used as the experimental material.

During the course of the experiment, the sacks were dipped in the extract. The extract was sprayed on the other experimental material like coconut fronds, wood pieces, wooden frame works and wooden pillars. The results of the experiment are detailed in the tabular column given below :-

Extract	Concentration	Experimental material	Results
Juice of banana (*Musa paradisiaca*) allowed to ferment for a day	100 %	Gunny bags, coconut frond, wooden frame work, wooden pillars, sticks	There was no termite attack for 50 days
”	50 %	”	”
”	25 %	”	Termite attack was prevented for 5 days
”	10 %	”	There was no control of termites
”	5 %	”	”
Fresh juice of *Musa paradisiaca*	100 %	”	There was no control of termites
”	50 %	”	”

— S. Thambidurai

TIPS

To prevent fungal diseases

Fungal diseases are caused by constant moisture and very little air circulating around the plants. When there is overcrowding water evaporates very slowly and this leads to constant moisture. Do not allow overcrowding of plants. Water the garden beds deeply and then allow the top level to dry out before watering. Remove affected plants or leaves from the garden as soon as possible.

Experiences of Mrs. Karpagam

Mrs. Karpagam belongs to Karumbakkam village of Kattankalathur block of Kancheepuram district. She cultivated a high yielding paddy variety called ADT-43 during the Navarai season (December – March). On the 60th day after transplantation, she observed symptoms of blast disease. She used the following treatment for control of this disease.

1. 1 litre of cow's urine was diluted with 9 litres of water to which 100 ml of Khadi soap solution was added as an emulsifier. This extract was sprayed on the crops.

2. After 4 days interval, 200 gms of sweet flag was powdered and soaked in 2 litres of water overnight. This extract was filtered. 500 ml of it was taken and mixed with 1 litre of cow's urine, 100 ml of khadi soap solution and 9 litres of water. It was mixed well and sprayed using a low volume hand sprayer.

On the fourth day after spraying sweetflag extract, half a kilo of neem kernel was taken and pounded. It was soaked in 3 litres of water and filtered. 500 ml of it was taken and mixed with 100 ml of khadi soap solution and 9 ½ litres of water. It was mixed well and sprayed with a low volume hand sprayer. Blast disease was effectively controlled one week after spraying.

Other farmers like Mrs. Thangammal of Venpakkam village and Mr. Varadharajan of Thiruvannaikovil had also followed this method and found it to be effective. On the contrary, the other farmers had sprayed a number of chemicals to control this disease but to no avail.

— S. Manikandan, K. Subramanian and K. Dharmaraj

Control of Epilachna beetle in bittergourd

Mrs. Poonkodi is a farmer from Nallur village of Thirukazhukundram block in Kancheepuram district. She actively participates in training programmes conducted by CIKS on indigenous agriculture and alternate systems of healthcare. She cultivated bittergourd in 25 cents of land during the Sornavari season (April - July). She observed the attack of Epilachna beetle in bittergourd on the 55th to 60th day of cultivation. Both the larva and adult stage of Epilachna beetle was effectively controlled by using an extract of spring onion, ginger, green chillies. The method of preparation of the extract is detailed below :

For 25 cents of land, ¼ kg spring onion, 200 gms green chillies, 200 gms ginger is required. The skin of the onion was removed and the onions were soaked overnight in kerosene. The next day, it was removed from kerosene and finely ground to a paste. Ginger and green chillies were also separately ground to a fine paste. All these were mixed with 3 litres of water, shaken well and filtered. The filtered extract was taken at the rate of 1 litre per tank and mixed with 9 litres of water and 100 ml of khadi soap extract. 3 tanks of this solution was sprayed on the leaves using a high volume power sprayer. Effective control of Epilachna beetle was observed within a week of spraying this extract.

— K. Subramanian

Indigenous Agriculture News
(Incorporating Pesticide Post)

Dear Readers,

Greetings from CIKS. For the past 10 years, Centre for Indian Knowledge Systems has been presenting novel and innovative alternatives to pesticides in the form of the newsletter "Pesticide Post". In the beginning this newsletter had highlighted the impacts of pesticides and had also been providing alternative solutions to chemical pesticides. In the past few years we have also been providing information on organic farming and indigenous methods of agriculture. In view of this expanding scope, we thought it apt to change the title of this newsletter from Pesticide Post to **"Indigenous Agriculture News"**. This newsletter will provide information on various aspects and experiences of indigenous agriculture. We are sure that you will find it useful. In view of the rising paper cost and postal charges, we have increased the subscription rates. Now, the annual subscription for individuals is Rs.35/- and for institutions it is Rs.70/- However, you will continue to receive this newsletter at the same cost till your current subscription ends.

With warm regards,

Dr. K. Vijayalakshmi

Control of Damping off disease in Brinjal

Mr. Chellan owns 2 ¼ acres of land in Vedanarayanapuram village of Kanchipuram district. He obtained seeds of indigenous brinjal varieties from the CIKS seedbank programme. During the germination stage, the brinjal seedlings were found to be affected by the damping off disease. This fungal disease attacks seedlings ultimately causing decay. To control the spread of this disease, he sprayed 200 ml of cow's urine mixed with 2 litres of water in the nursery as advised by CIKS. Spraying was done in the morning on two consecutive days. This treatment was found to effectively control the disease in a week's time.

— K. Subramanian

TIPS

Mint Extract for Disease Control

Take 250 grams of mint leaves (pudhina) and grind it into a paste. Add 1 - 2 litres of water and spray the solution over the plants. This controls the bacterial leaf spots very effectively. Before spraying add khadi soap solution (10 ml./litre) to the plant extract. One litre of extract can be used for 15 - 20 potted plants or for a crop in an area of 40 sq. meters.

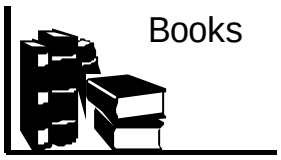
Diseases attacking Chilli Crop

Fusarium Wilt *(Fusarium oxysporum)*

There was a widespread occurrence of wilt disease attacking the chilli crop in the Kanchipuram district for the past 3 – 4 years. Due to this, the yield was badly affected.

Mr. Narayanaswamy of Thimmavaram village cultivates chilli in 3 cents of land. He observed the symptoms of wilt disease occuring in chilli soon after it started flowering. He pounded 100 gms of sweetflag *(Acorus calamus)* and soaked it in 1 litre of water. This extract was filtered. 500 ml of it was taken and mixed with 1 litre of cow's urine and 100 ml of khadi soap solution per tank and sprayed. This method not only controlled wilt but also enhanced flowering in chilli crop. Mr. Jegannathan of Thiruvanaikovil also used this treatment to effectively control this disease.

— K. Subramanian & S. Manikandan



Organic Vegetable Gardening : Revised and Enlarged edition ***by Subhashini Sridhar, S. Arumugasamy, H. Saraswathy and K. Vijayalakshmi, Centre for Indian Knowledge Systems, Chennai, 2002, pp.46***

The revised and enlarged edition of this book on "Organic Vegetable Gardening" focuses on how to grow vegetables in your garden without the use of chemical fertilizers and pesticides. It gives information about the importance of composting and techniques for preparation of compost. A section on laying out a vegetable garden is also provided. Cultivation details of some important vegetables are given. Description of pests and diseases attacking vegetables and their control methods are provided.

Price : Rs.35/- (English) Rs. 25/- (Tamil)

Available from : CIKS, 30, Gandhi Mandapam Road, Kotturpuram, Chennai-85

How to Order?

To obtain copies, please send a Money Order or Demand Draft favouring "Centre for Indian Knowledge Systems" payable at Chennai. Cheques are NOT acceptable. We also do not send books by VPP. (Please add Rs.15/- towards postal charges).

Cultivation of Medicinal & Aromatic Crops*by Farooqi, A.A. & Sreeramu, B.S., 2001, viii + 518 p.*

This book provides comprehensive information on the origin, distribution, description of the plant, species and varieties, soil, climate, propagation, planting, nutrition, water and weed management, plant protection, harvesting and yield, and analytical procedures for the active ingredients for 66 commercially important medicinal and aromatic crops.

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