



Indigenous Technical Knowledge in Cotton production and protection in India

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S. No	Title of ITK	Details of ITK and rationale	Reference
1	Prevention of shedding of boll of cotton by use of castor oil	Flowers and young bolls are often shed in cotton crop due to high temperature. To minimize this problem, farmers pour castor oil (approximately 50 ml) near the stem in the soil believing that it would cool the soil (Bharuch, Gujarat)	Karamiya (1992)
2	Use of <i>magha</i> rain water as growth promoter	Farmers store rain water received during the <i>magha</i> in the monsoon for future use. They believe that it works as growth promoter on the standing crop. According to them, the stored water does not get spoiled (Rajkot, Gujarat)	Kapadia (1997b)
3	Prunning for higher boll formation in cotton	Cotton plants grow tall in the highly fertilized field with good rainfall. Farmers cut the top branch of the plant which checks the erect growth of the plant. It is believed that such practice imparts good flowering and retards vegetative growth (Surendranagar, Gujarat).	Patel (1991 f)
4	Minimizing the effect of frost in cotton by fumigation and irrigation	Farmers practice fumigation and irrigation in the fields of cotton when they anticipate frost. Fumigation is done by cowdung cake, used engine oil or waste grass. They have been practicing this for the last 20 years. Some farmers make tall hedges around the field to protect the crop from frost (Mehsana, Gujarat)	Dayabhai (1992)
5	Control of aphids by <i>Calotropis</i> soaked in water	Leaves of <i>Calotropis</i> plant are immersed in water channel during irrigation to minimize aphid infestation (Banaskantha, Gujarat)	Thakor (1991)
6	Control of aphids in mustard by <i>neem</i> twigs in Folidol	Farmers prepare ash from leaves and small twigs of <i>neem</i> and incorporate it in Folidol (a chemical pesticide) powder. The mixture is dusted on mustard to minimize infestation (Banaskantha, Gujarat)	Desai (1991 b)

7	Control of aphids in pulses by tobacco decoction	Application of tobacco decoction mixed with soap emulsion is done to control aphids in pulse crops (Many parts of the country)	
8	Control of aphids in Lucerne by <i>Calotropis</i> soaked water	Farmers place freshly cut branches of Akada (<i>Calotropis gigantea</i>) in irrigation channels to control aphid infestation in Lucerne (<i>Medicago sativa</i>). Akada with white and violet flowers is commonly found in uncultivated lands and it's latex irritates skin (Junagadh, Gujarat)	Alabhai (1992)
9	Control of aphids	A little quantity of castor oil is added during irrigation in the water channel for reducing aphid population (Ahemdabad, Gujarat)	Patel (1991c)
10	Control of aphids in Lucerne by dusting ash	It is collected from either house <i>Chulah</i> or by burning cowdung cakes (Mehsana, Gujarat)	Bavabhai (1992 b)
11	Control of pest complex in cotton	<i>Helicoverpa</i> , spotted bollworm and aphid are generally found in cotton. Aphids are also common in brinjal, chilli and Lucerne in Amreli district of Saurashtra. A mixture was prepared from dried tobacco leaves (250 g) <i>hirakasi</i> (300 g) and citric acid by boiling in 1-2 litres of water and filtered. Approximately 250 ml of the decoction was mixed in 15 litres (one pump full) water and sprayed over crop. Depending upon the growth and density of the crop, total quantity required varied; however three to four pumps were enough for cotton crop. After a week decoction was sprayed again. It could control pest complex in cotton and the growth of the plants also boosted (Amreli, Gujarat)	Kalyanbhai (1995)
12	Control of <i>Talkidi</i> insect in cotton by onion soaked water	<i>Talkidi</i> a soil pest, attacks fully grown cotton plant. Affected plant withers in a short time. To control <i>talkidi</i> , farmers take 20-25 kg onions in a jute bag, crush them using a wooden mallet, and this bag is kept in water channels during irrigation (Bhavnagar, Gujarat)	Thyammal (1994)

13	Pests and diseases control of cotton and <i>Barleria</i> spp	Leaves of agave, <i>Vettikottai</i> (<i>Strychnos nuxvomica</i>), neem, and cakes of <i>Pongamia</i> (<i>Pongamia Pinnata</i>) and neem are pulverized together and soaked in cattle urine. The resultant solution is diluted in water in 1:8 and sprayed against pests and diseases of cotton and <i>Kanakambaram</i> (<i>Barleria spp</i>), an ornamental flowering crop (Sirakkapatti)	Thyammal (1994)
14	Control of pests in Cotton	<p>(i) Mechanical control measures include cotton seed treatment with cow dung resulted in delineating of the seed (fibre free seed), followed by identification and removal of pink boll worm infested seeds and hand collection, destruction of larvae and infested plant parts leads to reduction in insect pest population.</p> <p>(ii) Cultural control measures includes field sanitations – clean cultivation during the entire cropping seasons which results in the reduction of insect fauna and weed flora in the filed and intercropping or mixed cropping of cotton with sorghum/maize/greengram/blackgram for augumentation and conservation of natural enemies of major insect pests.</p> <p>(iii) Application of botanical pesticides include aqueous decoction of <i>neem</i> leaf (<i>Azadirachta indica</i>) or neem seed kernel or tobacco leaf (<i>Tobaccum solanum</i>) or alcoholic extracts of <i>neem</i> seed kernel against pest complex of cotton.</p> <p>(iv) Alternatively for pest management, application of ash water in which leather is soaked by cobbler against sucking pest or fermented butter milk or mixture of fermented farm animal urine + distillates of <i>neem</i> seed kernel or application of kerosene oil is practiced against insect pest complex of cotton (West Nimar, Madhya Pradesh).</p>	Paliwal et al. (2002)

15	Control of pests in cotton	Non-pesticidal management technologies include deep ploughing in summer, use of bonfires/light traps, nipping of the terminal buds to destroy eggs and larvae of spotted bollworm, selecting tolerant varieties for sucking pest complex, spraying of tobacco decoction, spraying of 5% <i>neem</i> seed kernel suspension, chilli garlic spray and spraying of cattle dung and urine, bird perches, collection sand destruction of affected bolls. The farmers who practices this traditional knowledge gained more income as compared to the farmers who treated with pesticides (non NPM) in Warangal district of Andhra Pradesh. The farmers cultivating cotton in Warangal district with high pesticide load are prone to risk of negative returns as compared to the traditional practices. Farmers in Jalgaon/Jalna spent more money for pesticides which enhanced cost of production while traditional NPM technologies reduced the cost of production by 25% (Warangal and Zaheerabad, Andhra Pradesh; Jalna and Bawalaeshwar, Maharashtra)	Chary et al. (2000)
16	Control of whitefly in cotton	Whitefly (<i>Bemisia tabaci</i>) is usually found on the dorsal surface of the leaves. The nymphs are small and flat with visible beaks that suck the plant sap. To get rid of these flies, papers pasted with castor oil/grease are hung at five or six places in the cotton field. Then air is blown using a sprayer over the crop. The disturbed adult flies (white fly) come out of the plant and stick to the oily paper. By this method 90% of white fly can be successfully reduced (Pondicherry)	Balasubramanian (2000-2001)
17	Insect control measures in cotton	Concentrated solution of sugar (500 g in a litre of water) is prepared and allowed to ferment. Fermented solution is placed in open dishes at different locations	Sindha (1992)

		between the rows of cotton. One or two drops of edible oil are added to the dish. The users say that adult insects (which can fly) are attracted towards this solution. The idea behind this practice is to kill the adult population and ultimately reduce the reproduction (Bharuch, Gujarat).	
18	<i>Calotropis</i> for control of caterpillars in cotton	Caterpillar infestation can severely damage a cotton crop. Reportedly the latex of <i>Akda</i> (<i>Calotropis gigantea</i> , when diluted with 15 parts water and sprayed on the crop, effectively controls the pest within three days. The new growth after treatment is also free from infestation (Bhavnagar, Gujarat)	Jani (1992)
19	Control of green worm (<i>Heliothis spp</i>) in cotton by dhatura	Of all the pests occurring in the cotton crop, greenworm (<i>Heliothis spp.</i>) is one of the most harmful pests. Leaves and stem of <i>Dhatura</i> (<i>Datura metel</i>) are used to control green worm. About 250 to 300 g of <i>Dhatura</i> ' leaves along with stem are dipped in 1 litre of lukewarm water. After cooling down, 250 to 300 grams of the solution is mixed with 15 litres of water and sprayed on the crop. Pests perish within a period of six to seven hours. Spraying the mixture when the crop is of one-month-old yields better results (Amreli, Gujarat).	Kaachhadiya (1998)
20	Control of disease in cotton by butter milk	When red spots appear on cotton leaves (in July or August), farmers dilute buttermilk with water and sprinkle it on the crop. When the application is made during the early stages of the disease, control comes within a week. This practice can also be used as a preventive measure (Bhavnagar, Gujarat)	Pandya (1993)
21	Control of insects in cotton by kerosene	Farmers spray kerosene oil on the cotton crop at night to control larvae (locally known as <i>Lashkari</i>). Farmers believe that this pest remains in the soil, cracks during the day and attacks the crop at night. It attacks crops like cotton and Lucerne in a cluster like an	Rana (1992)

		<p>army brigade. This might have been the reason for giving it the name <i>Lashkari</i>. Some farmers mix kerosene in the irrigation water. They make a hole in the bottom of a tin of kerosene and hang it on the top of a water channel in such a fashion that the tin drops kerosene slowly at regular speed and uniform suspension goes to plot regularly. They believe that this is more effective than spraying because it kills all the larvae hidden in the soil cracks. Farmers realize that this practice also kills some of the beneficial organisms living in the soil. The practice is in use for more than 50 years and a large number of farmers are still using it (Surendranagar, Gujarat)</p>	
22	Control of white fly in cotton by tobacco	<p>Some farmers add tobacco powder/just @ 30 g per 15 litres with insecticide solution mainly with the idea of controlling the attack of whitefly (Gujarat)</p>	Mane (1991)
23	Use of okra (<i>Ablemoschus esculentus</i>) as a sacrifice crop for pest control in cotton.	<p>Farmers grow 2-3 lines of okra plant surrounding the cotton field. Cotton is more susceptible to insect pests like spotted bollworms (<i>Earias vitella</i>), worm (<i>Platyedra gossypiella</i>), Jassid <i>Amarasca biguttula</i>) etc. Farmers believe that pests prefer okra plant as compared to cotton plant and attack them first. Pest is controlled by simply eradicating/destroying the okra plants attacked by insect and pests (Surendranagar, Gujarat).</p>	Patel (1991 g)
24	Control of cotton boll worms and pod borer of chickpea and pigeonpea by neem seed extract	<p><i>Neem</i> seed extract solution (5%) is prepared and sprayed to control cotton boll-worm and pod borer of pigeonpea and chickpea (Yavatmal, Maharashtra)</p>	Bhople and Lakbdibe

25	White fly control in cotton by seed extract of <i>Nerium</i>	<i>Arali (Nerium oleander)</i> seeds are pulverized, soaked in water overnight and filtered. This filtrate is diluted in water and sprayed on cotton fields. This practice provides 70% control (Thiruvadagam).	Murugesan (1994)
26	Control of white fly in cotton by jaggery solution	Some farmers use <i>gur</i> (jaggery) solution to control white fly. One kg is dissolved in 10-12 litres of water and filtered through a thick cotton cloth. Approximately 5-6 litres solution is sprinkled in one acre with the help of sprayer pump gently on the foliage. The tiny insects of white fly stuck on the leaf surface due to stickiness of the solution. All the stuck eggs of white fly are killed on the leaf surface which increases the possibility of occurrence of Madhiya disease. Hence they prefer to use this practice once only. This practice can achieve 4-50 percent control of whitefly. This technique is used in the months of November-December (Bharuch, Gujarat).	Ahmedabadi (1992)
27	Insect control in cotton by tobacco and <i>neem</i> extract	Farmers in this region use boiled suspension of tobacco (leaf or seed) and <i>neem</i> seeds and leaves to control insects in cotton (Mehsana, Gujarat).	Patel (1991 g)
28	Increasing yield of cotton by application of salt mixed with manure	20 to 25 kg of common salt is mixed with about 10 cart loads of natural manure and is applied in farm during <i>Jyeshtha-Vaishakh</i> (May). It would be more effective if the mixture is applied uniformly in all the furrows. 10 maunds of cotton/ <i>bigha</i> is received (1/3 of acre). It is believed that the manure increases the crop's resistance to pests (Surendranagar, Gujarat).	Sanghani (1998)
29	Collection and usage of farm yard manure	Farmers in this region primarily keep their animals to meet the need of manure. It is collected from cow sheds either inside or outside the house. The dung is put outside the house in a heap in lower areas, whereas in upper areas	Verma (1998)

		it is directly put in heaps in the fields and covered with a thin layer of soil to avoid its dispersion by wind. Farmyard manure is transported to the fields in Kilta (bamboo container) by people's participation and also by horses. On an average 125-250 q/acre of manure is used by the farmers throughout the region. Cowdung is preferred mostly for farmyard manure compared to goat and sheep manure because the latter in large quantities leads to burning of crops due to the toxic effects of high levels of N (3%), P (1%) and K (2%) (Kinnaur, Himachal Pradesh).	
30	Use of cowdung and mud slurry for seed treatment of <i>desi</i> cotton	Due to fuzzyness, it is difficult to sow cotton seed as such. To cope up with the problem, farmers of Dhule, Nandurbar, Jalgaon and Ahmednagar districts of Maharashtra, treat the cotton seed with cowdung and mud slurry. It facilitates easy sowing of cotton seeds. According to seed quantity, cowdung is mixed with soil in proper proportion to prepare a slurry to spread over the seed. The seeds are rubbed to apply slurry uniformly. It is then dried under shade. After drying, the seeds are sown, This treatment is given a day before sowing. It also helps in good germination thereby giving 10% more yield.	Director of Extension Education Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722
31	Summer pearl millet after cotton, a new cropping system	Since last 4-5 years, some farmers of Dhule, Nandurbar, Jalgaon and Ahmednagar district of Maharashtra have started cultivation of pearl millet in summer after <i>Kharif</i> cotton. The area under <i>Kharif</i> cotton is increasing day by day, thereby reducing the area under food crops. The farmers themselves have felt the shortage of food grains for their family and fodder for their cattle. To overcome this problem, farmers have started taking summer pearl millet after <i>Kharif</i> cotton and they are getting good-quality grains and fodder as compared	Director of Extension Education, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722

		to the <i>Kharif</i> crop. Moreover, yields are also more. Sowing is done in January by using double the seed rate than used in <i>Kharif</i> . All other packages of practices are the same as that for <i>Kharif</i> . Only 5-6 irrigations are required. No pests and diseases have been noticed so far.	
32	Dry sowing of cotton, pigeonpea and rice	For getting advantage of early seeding in <i>Kharif</i> season, farmers resort to dry seeding of cotton (local variety), pigeonpea and rice. Seeding is generally done 10-12 days before the anticipated date of onset of monsoon. In this practice, dry seeded crops give the advantage of 8-10 days earlier sowing than normal. When sufficient rains are received, the dry seeded grains start germinating. In dry seeding, however, there is a risk of re-sowing in the event of receipt of inadequate rainfall. Otherwise it gives 10% more yield. Dry seeding of cotton and pigeonpea is in practice in Dhule, Nandurbar and Jalgaon districts of Maharashtra. Dry seeded rice is taken in Taloda and Akkalkuwa tehsils of Nandurbar district in Maharashtra.	Director of Extension Education, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722
33	Ratooning of <i>Kharif</i> cotton	In Nandurbar, Dhule and Jalgaon districts of Maharashtra, farmers are taking ratoon crop of cotton. The farmers who are having irrigation facilities are following this practice. Ratooning is done after 3-4 pickings of cotton and the crop is supplemented with chemical fertilizers and 2-3 irrigations till February-March. The farmers get additional yield of about 10-15q/ha, in addition to previous harvest.	Director of Extension Education, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722
34	Ratooning of rainfed cotton raised on deep black soil	In Shevgaon and Pathardi tehsils of Ahmednagar district, farmers take cotton during monsoon/rainy season, which is harvested upto end of November/December. But during the last 5-6 years it has been observed that rains are received during November/December. During this time	Director of Extension Education, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar

		new growth of leaves, branch, bolls etc. is observed from stubbles of cotton plants. In this crop only weeding operation is done The flush of flowers get matured within 2 months and farmers obtain 4-6q/ha of cotton yield.	(Maharashtra) 413 722
36	Raising of sorghum as mixed crop in cotton as bird percher	In Jalgaon, Nadurbar, Dhule and Ahmednagar districts of Maharashtra, the farmers raise sorghum as a mixed crop scattered in cotton fields. The grain of sorghum attracts the birds and served as a perch for the birds to reach the insects of cotton plants.	Director of Extension Education, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722
37	Use of fermented pearl millet flour in water to control Helicoverpa	Tribal farmers of Nandurabar district of Maharashtra use fermented pearl millet flour to control Helicoverpa in cotton. About 10Kg pearl millet flour is mixed with 200 litres water in plastic drum and it is kept for fermentation under the heap of compost for 8 days. After 8 days the solution is sprayed on cotton to check infestation of <i>Helicoverpa</i> .	Director of Extension Education, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722
38	Spraying of mixture of garlic extract and monocrotophos to control bollworm in cotton	Farmers of Sindhkheda and shirpur tehsils of Dhule district and Kopargaon tehsil in Ahmednagar district are using this practice. Garlic bulbs are crushed and soaked in water to draw extract. This extract is added to monocrotophos and it is sprayed on cotton to control cotton bollworm.	Director of Extension Education Mahatma Pule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722

39	Control of cotton pests by using jaggery	In cotton, small farmers of Pachora and Bhadagaon thesils of Jagaon district and Shevgaon and Newasa telsils of Ahmednagar district in Maharaastra use jaggery to control pests. Small jaggery particles are put at the bottom of a cotton plant. It helps increase the population of ants, which eat aphids, bollworms etc. Normally a numbers of sprayings are required to control cotton pests by using insecticides. Due to use of jaggery particles, the pests are controlled, which requires no technical skill and the cost involved is also quite little.	Director of Extension Education Mahatma Pule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharaastra) 413 722
40	Use of tobacco decoction to control cotton bollworm	Tobacco is soaked in water overnight. The extracted decoction is used for spraying to control bollworm in cotton. This practice is being followed in Dhule and Ahmednagar districts of Maharaastra.	Director of Extension Education Mahatma Pule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharaastra) 413 722
41	Use of garlic and <i>chilli</i> extract to control pests in cotton	An extract is prepared using 500g garlic and red <i>chillies</i> . The extract is added to 100 litres water, mixed with 200g soap and sprayed on cotton to control sucking as well as other pests. This practice is in vogue in Dhule and Ahmednagar districts of Maharaastra.	Director of Extension Education Mahatma Pule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharaastra) 413 722

42	Use of <i>neem</i> seed powder to control bollworm and sucking pests of cotton, <i>chilli</i> and onion.	About 5kg neem seed is well dried in sun, ground to powder form and soaked in 10 litres water for overnight. It is then added in 90 litres water and 500 g soap is added as sticker. This solution is sprayed on cotton, <i>chilli</i> and onion to control pests. Farmers of Nandurbar, Dhule, Jalgaon and Ahmednagar districts of Maharashtra are using this practice.	Director of Extension Education Mahatma Pule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722
43	Dusting of ash, spraying of cow urine and kerosene + soap mixture for control of aphids, jassids and whitefly on vegetable crops and cotton	The tribal farmers of Nandurbar and Ahmednagar districts of Maharashtra treat the seeds of vegetable crops by dusting ash and spraying of cow urine. It is very rarely applied on <i>chilli</i> , brinjal and cucumber to control aphids and jassids. Some farmers spray cow urine in cotton for control of aphids and jassids. In tribal areas some farmers also spray kerosene + soap on cotton crop to control whitefly attack. This is an economic practice and the cost involved is much less as compared to chemical insecticides. Key words: ash, cow urine, kerosene + soap mixture.	Director of Extension Education Mahatma Pule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722
44	Storage of food grains in bins made of bamboo and cotton sticks	Marginal farmers of Nandurbar, Dhule, Ahmednagar and Jalgaon Districts of Maharashtra. Store food grains in bins for a longtime in good condition without any incidence of storage pests. After sun drying of the grains, it is stored in bins made of bamboo and cotton sticks and covered with mud and cowdung slurry so as to make the bin airtight. In some areas neem leaves are also mixed with the grains while string.	Director of Extension Education Mahatma Pule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) 413 722

45	Ratooning of <i>Kharif</i> cotton	Some farmers in Pimpri village of Dhule Districts in Maharashtra have started taking ratoon crop of <i>Kharif</i> cotton. The farmers having irrigation facilities take the ratoon. It is taken after 3-4 pickings are done. The crop is provided with chemical fertilizers 2-3 irrigations are given till February – March. This practice is followed to obtain additional returns from the same crop. An additional 10-15 q/ha is obtained from the same crop if it is properly managed. The practice has been in use for 8-10 years. About 10-15 farmers are practicing this technology.	Prof. P. S. Patil Training Organiser Krishi Vijayan Kendra, Dhule (Maharashtra) 424 004
46	Use of cowdung and mud slurry for seed treatment of <i>desi</i> cotton	The cowdung is mixed with mud in equal proportion to prepare a slurry. The slurry is spread over the seed and rubbed for uniform application, then dried under shed. Then treatment is given day before sowing. The method helps in sowing operation and improves germination and yield. Keywords: cowdung and mud slurry	Prof. P. S. Patil Training Organiser Krishi Vijayan Kendra, Dhule (Maharashtra) 424 004
47	Eco friendly cropping systems	The various traditional crop combinations to reduce the pest and disease in different parts of the country are as follows Maize-mary gold: Reduce nematode populations Tomato-crotolaria: tomato yield increased Rice-garlic-corn-tomato: Reduce nematode population Groundnut-mustard: reduce nematode population Rice-tobacco-rice: control of root Knot population Sunflower + cotton: reduce the leaf hopper damage Sorghum + cowpea (1:1): control stem borer of sorghum Wheat + chickpea (1:1): reduces the pod borer attack Castor+ cowpea (1:1): reduces the aphid damage	Dr. Subba Reddy Dr. H.P. Singh, CRIDA Santhoshnagar Hyderabad (Andhra Pradesh) 500 059

48	Direct seeding of cotton	Cotton is sown through dibbling by hand without any ploughing after harvest of crops such as finger millet, pearl millet with one time irrigation. About 80-100 farmers of Medur village in Coimbatore district in Tamil Nadu are adopting this practice for the last 10-20 years.	Shri M. C. Murugesan Kuranoor Thottam, Medur Coimbatore 641 113
49	Use of tobacco decoction to control the larvae of <i>Heliothis armigera</i> in soybean crop	Farmers of Azamgarh collect 1.5-2.0 kg green leaves of tobacco and boil in 5-6 litres of water till the solution becomes dark brown. Then it is filtered and kept for 6-7 hours for cooling. 4-5 litre decoction is mixed with 70-80 litres of water. The solution is sprayed over the affected crop. The practice is repeated at 5-6 days interval. This controls <i>Heliothis armigera</i> in soybean Keywords: tobacco decoction, spray, <i>Heliothis armigera</i> , soybean	Shri Ranjay Kumar Singh Ph. D Scholar (Agri. Extn.) C/o Dr. C. B. Singh, Dean College of Agriculture C2Krishi Nagar Colony Adhartal, Jabalpur (Madhya Pradesh) 482 004
50	Control of aphids by using neem extract	The extracts of neem seeds/leaves possess insecticidal properties, which is sprayed on the aphid-infested crops. Thus the aphids are controlled effectively. This technique is cheaper than the chemical application	Shri. Hari Prasad Vashishth Assistant Agric. Inspector Joshimath Chamoli (Uttaranchal)
51	Growing of Sorghum plants in scattered manner in cotton field	In rainfed cotton, sorghum plants are sown in scattered manner, which provide avenue for birds to perch and eat larvae of pests on cotton. This is one of the method controlling cotton bollworm. The idea is that the sorghum plants attract the birds to eat grains and when they come for eating grains, they also pick the larvae on the cotton crop. This is a practice, which has been in use of the villagers of chande of Dhule district in Maharashtra for 20-30 years and 20-30 farmers are using the practice.	Shri. P.S. Patil Training Organiser Krishi Vijayan Kendra, Dhule (Maharashtra) 424 004

52	Raising border crop in cotton/groun dnut	Around 100 plants of castor per acre are grown on the field bunds in the Spodoptera-affected field crops, because of its broad leaves. Spodoptera lays eggs on castor rather than on field crop leaves and skeletonize the leaves. These leaves are removed from the field.	Shri. K. Lakshmana Ph.D. Scholar, PG Hostel College of Agriculture ANGRAU, Rajendranagar Hyderabad (Andhra Pradesh) 500 030
53	Herbal Pesticide formulation for cotton	Herbal Pesticide formulation has been developed by Shri Nagarajan to control pests in cotton. 500g neem seeds, 1000g tobacco, 100g <i>Acorus calamus</i> , 250g Asofoetida and 50g <i>Sapindus emarginata</i> seeds are ground and the extract is sprayed for one acre cotton to control pests.	Shri. K. Nagarajan S/o Kethaian Gouda Koralamatti, Konur Dindigul (Tamil Nadu)
54	Pest and nutrient management in crops by use of cow urine and dung	Cow urine and dung are collected, mixed with water and fermented for few days. After fermentation, the content is sieved and the extract is sprayed to control sucking pests and leaf cutters. Cow urine acts as germicide and cow dung provides nutrients to the crops. This practice is followed by 5% families for the last 25 years.	Shri Sreekanth Ramu Shirahatti, Harogeri Raibag, Belgaum (Karnataka) 591 220
55	Fungal disease control in chillies, cotton and lemon	Fungal disease control in chillies, cotton and lemon fruits is controlled by spraying a mixture, locally prepared called Panchagavya. The mixture is prepared by mixing 5 parts milk, 2 parts curd, ½ part ghee, 2 parts cow urine, ½ part cowdung and 10 parts water. The mixture is kept for 7 days before it is sprayed in field where fungal disease is predominant. Spray of the mixture also controls leaf shedding and enhances flower setting. Ten farmers of Periakovilankulam village follow this practice for the last three years.	Shri. S. Murugesan Periakovilankulam Sankarankovil, Tirunelveli (Tamil Nadu) 627 953

56	Control of cutworm in cotton	Citrullus grandiflora (periya kumuttikai), Cissus quadragularis (perandi kodi), Tecoma stans (yellow arali seeds) and Azadirachta indica (neem leaves/seeds) are ground and pasties prepared. The paste is allowed to ferment as such for 10 days. Paste from <i>Sesbania grandiflora</i> is made separately and fermented. After 10 days, the fermented pastes are filtered though a thin cloth, diluted with required quantity of water and sprayed over the foliage. This controls the cutworms in cotton very efficiently with no side effect.	Shri S. Pidhai Muniandi Koil Street Jayanangalam Periyakulam Theni (Tamil Nadu)
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