

ECO-FRIENDLY PEST MANAGEMENT PRACTICES FOR CABBAGE



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FOREWORD

Concern about environmental safety and sustainability of land productivity is increasing among the scientists, administrators and environmentalists. The strategy adopted during the green revolution era can not be valid any more under the prevailing conditions. A new strategy of living with the nature and nurturing it for sustainable high productivity should be evolved. Eco-friendly pest management shows us the way to effectively use the available natural resources for the benefit of the mankind. Due to the significant increase in the human population, and the consequent increase in the amount of food and grains produced, many small-scale farmers adopted the use of pesticides as a mean of pest control. Chemical control forms the prime and foremost method for the management of insect pests of agricultural and horticultural crops. Prolific use of chemical insecticides significantly curtailed the insect pests in the past but in due course it resulted in the development of resistance to insecticides in insects, environmental degradation and increase in the cost of cultivation. The use of pesticides is being done indiscriminately for production of different crops, fruits and vegetables, which contaminate them to a great extent, especially in the vicinity of big cities. Almost five decades of pesticides use have left us at a tragic legacy; severe contamination of our soil and water system, increased cancers, birth defects and other ailments in humans and the emergence of powerful pests which are resistant to chemical pesticides. About 508 insect species have developed resistance against different chemicals. According to the World Health Organization (WHO) approximately one to two million persons are affected every year because of pesticides. Considering such ill effects of pesticides, both the scientists and planners realized the need to reorient the methodology and efforts to overcome these significant yield limiting factors with more eco-friendly manner. This Technical Bulletin *"Eco-friendly pest management practices for Cabbage"* can provide food security by preventing and reducing crop losses, promote self-reliance by women farmer participatory approach, contribute to poverty alleviation by focusing on women farmers and protect environment and health by reducing chemical inputs on our unique planet earth.

Authors

India is the world's second largest producer of vegetables next to China. Orissa is the third leading state of India in the production of vegetables followed by West Bengal and Uttar Pradesh. According to the recommendations given by Indian Council of Medical Research (ICMR) an average man with vegetarian or non-vegetarian food habit should consume 125 gm of leafy vegetables, 100 gm of roots and tubers and 75 gm other vegetables. The recommendations for an average woman are more or less same with exception in roots and tubers which should be consumed @ 75 gm per day. Vegetables are the only natural sources of protective food, supplying all the nutrients specially minerals, vitamins and crude fibre.

Cabbage is *Brassica oleracea* L. var. *capitata* belonging to family cruciferae. It is one of the most economically important cole crop which is second next to cauliflower in area and production. It is mostly grown in Southern, Eastern and Coastal areas of India. It is generally consumed as fresh leafy vegetable or raw as salad. Cabbage is distinguished by its swollen head which is formed by thickening of edible bud with thick tightly packed overlapping leaves manifesting a large head. The shape of the head may be round, conical, oblong, flat or savoyed depending on the variety. It covers an area of about 2, 50,000 ha which is about 4% under vegetable crops in our country with an annual production of 50 lakh metric tones. The yield has increased because of induction of heat tolerant hybrids. It can further be increased by developing improved cultivars, disease resistant F₁ hybrids and adopting efficient production technology for different agro-climatic regions of India.

It is used in various forms viz; salad, boiled, cooked into curries and pickles etc. It is known to possess medicinal properties. It has been found to use against ailments like gout, diarrhoea, stomach and coeliac troubles. It also contains anti cancer property and helps in digestion. Shredded cabbage (sauerkraut) has a curative effect on scurvy disease. Cabbage is rich in mineral content and vitamins. It has been found to originate from Mediterranean Sea from where it spreaded over to whole of Europe. The exact date of introduction of cabbage into India is not certain but is known to be cultivated during the Mughal period. Basically, cabbage is a crop of temperate zones but it has spread to both subtropical and tropical regions of the world. The major varieties of cabbage are Golden Acre, Pusa Mukta, Pride of India, Pusa Drum Head, Late Large Drum Head, Pusa Ageti etc. where as the hybrids are Bajrang, Swarna, Sudha, Sri Ganesh Gol, Nath Laxmi 401, Ganga, Kaveri, Kalyani, Kranti, Golden Cross, Green Ball, Green Cornet, Green Express, Stone Head etc.

From the dawn of the history of mankind, we know that our natural environment has been the source of our progress and development. Although, science and technology has progressed far, human beings are now subjected to live in a much polluted environment and unhealthy conditions. Unfortunately, our environment is deteriorating day by

Nutritional information

Component	Per 100 gm edible portion
Food energy	24.0 k cal
Moisture	92.4%
Protein	1.3 gm
Fat	0.2 gm
Carbohydrates	5.4 gm
Calcium	49.0 mg
Phosphorus	29.0 mg
Iron	0.4 mg
Vitamin A	130 (IU)
Thiamin	0.05 mg
Riboflavin	0.05 mg
Niacin	0.3 mg
Ascorbic acid	47.0 mg

day, until one day; it will become a threat to human existence. Today, the main causes of human deaths are cancer and diseases of the heart and brain. Surveys show that 75% of cancer is caused by environmental pollution and various carcinogenic chemicals absorbed by humans. We are the ones who are continuously destroying our very own living environment. Man cannot live without even one of the essential elements of life-air, soil, water and sunlight. It should be realized that humans need to co-exist in harmony with natural environment in order to survive. A number of insect-pests and diseases attack the cabbage because of which the yield and productivity is reduced. The major insect pests include cabbage butterfly (*Pieris brassicae*), Diamond back moth (*Plutella xylostella*), Tobacco caterpillar (*Spodoptera litura*) aphids etc. The major diseases of cabbage are damping off, downy mildew, alternaria, rhizoctonia, black rot, soft rot etc. For quality production of cabbage serious attention has to be paid to empower the farmwomen and farming community for eco-friendly pest management, which is the most important concern of the whole world today.

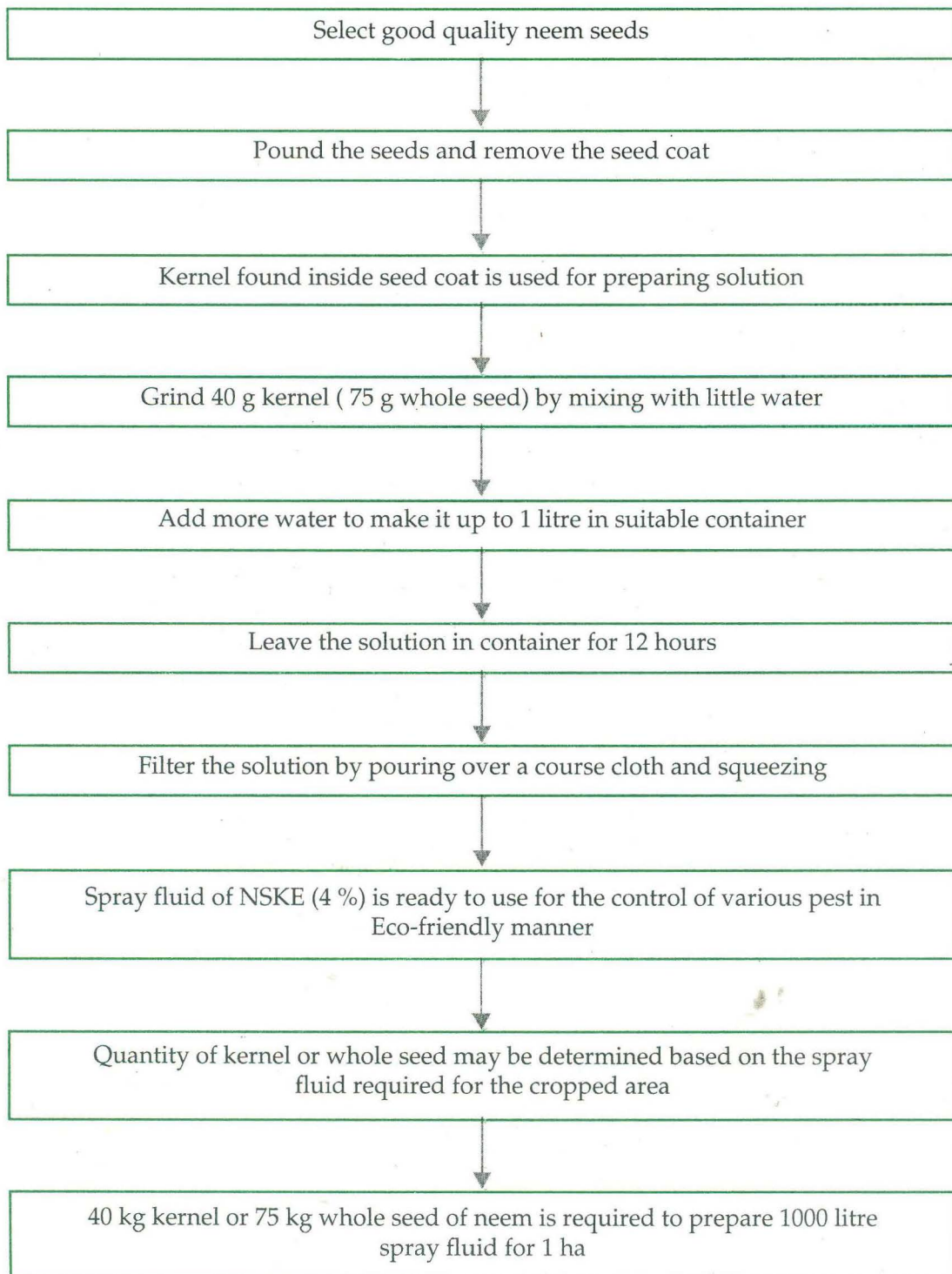
Eco-friendly pest management package for Cabbage

1. Collection and destruction of crop debris of previous harvested crop.
2. Field sanitation and removing of alternate hosts help the crop free from pests.
3. Deep ploughing in summer season helps in exposing resting stages of pests and soil borne nematodes to sunlight.

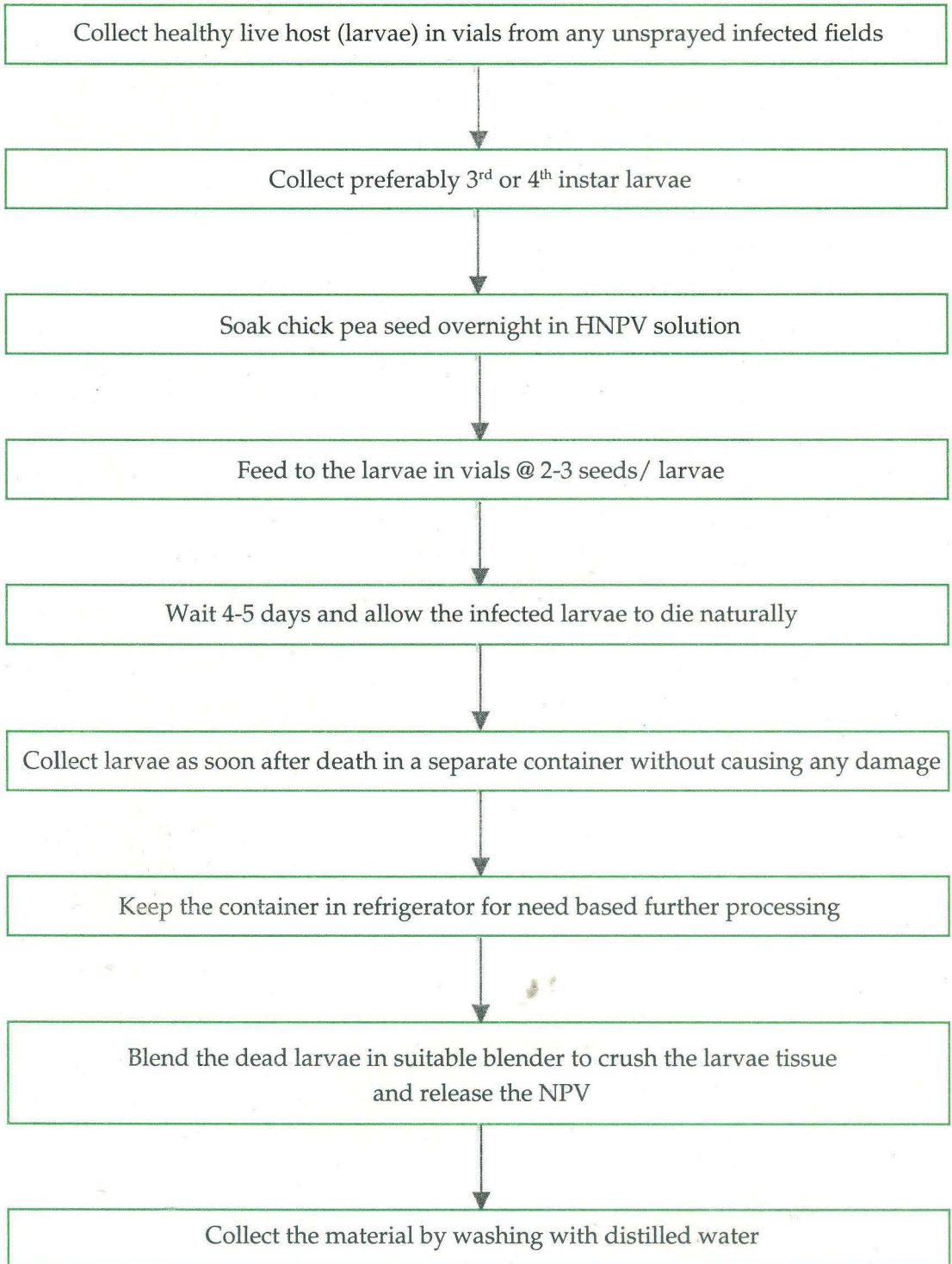
4. At the time of last ploughing incorporate Karanj (*Pongamia glabra*) oil cake @ 250 kg/ha in the soil. The pesticidal effect of Karanj controls soil borne pests and also provides nutrient to the crop.
5. Raised nursery beds at least 10 cm for good drainage thereby preventing soil borne fungi.
6. Seed treatment with *Trichoderma viridae* @ 4g or Carbendazim @ 2g /1000 g of seeds to prevent soil borne fungal infection.
7. To attract pests like sucking insects and moths, plant like bhindi (okra) and mesta can be grown in cabbage crop, thereby the attack on main crop is reduced.
8. Use of 100-mesh nylon net in nursery beds to avoid entry of cabbage butterfly (*Pieris brassicae*), Diamond back moth (*Plutella xylostella*), Tobacco caterpillar (*Spodoptera litura*) etc.
9. Installation of pheromone traps for Diamond back moth and Tobacco caterpillar @ 12 traps /ha with replacement of lures once in 15 days. Trap should be installed in the field in such a way that the position of the lure is always 2 to 3 feet above the crop canopy. The trapped moth should be collected and killed daily.
10. Conserve parasitoids like *Telenomus remus*, *Chelonus heliopae*, *C. formosanus*, *C. blackburni*, *Eriborus* sp., *Cotesia colemani*, *Cotesia marginiventris*, *Microplitis* sp., *Charops obtuse*, *Euplectrus* sp., *Peribae orbata* for *Spodoptera litura*.
11. Avoid excess dose of Nitrogen.
12. Spray 4% NSKE (40 ml/ litre) (Flow chart for the preparation of NSKE is given in the last of the text) or neem seed powder (7%) at 15 and 25 days after planting and it should be repeated for 2 times at 10 days interval for the control of leaf eating insects.
13. Install bird percher @ 50/ha to encourage birds to feed on pests.
14. Spray *Bacillus thuringiensis* var. *kurstaki* @ 500g/ha against lepidopteron pests.
15. Spray NPV 250 LE four times in the evening at an interval of 4-7 days for a pure cabbage crop. Flow chart for the preparation of NPV is given in the last of the text.
16. About 1 kg tomato stem and leaves are kept immersed in 10 litres warm water for 4 hours and a solution is prepared. The solution is stained thoroughly and spread over the affected cabbage for the control of cabbage pests like cabbage semi looper and diamond back moth etc.
17. Dig a pit of required size in barren field itself to mix cow dung, cow urine, chilli and garlic in sufficient water. These are kept in the pit for at least 10-15 days for proper decomposition. Then the decomposed mixture is sprayed on cabbage at 15 days interval.

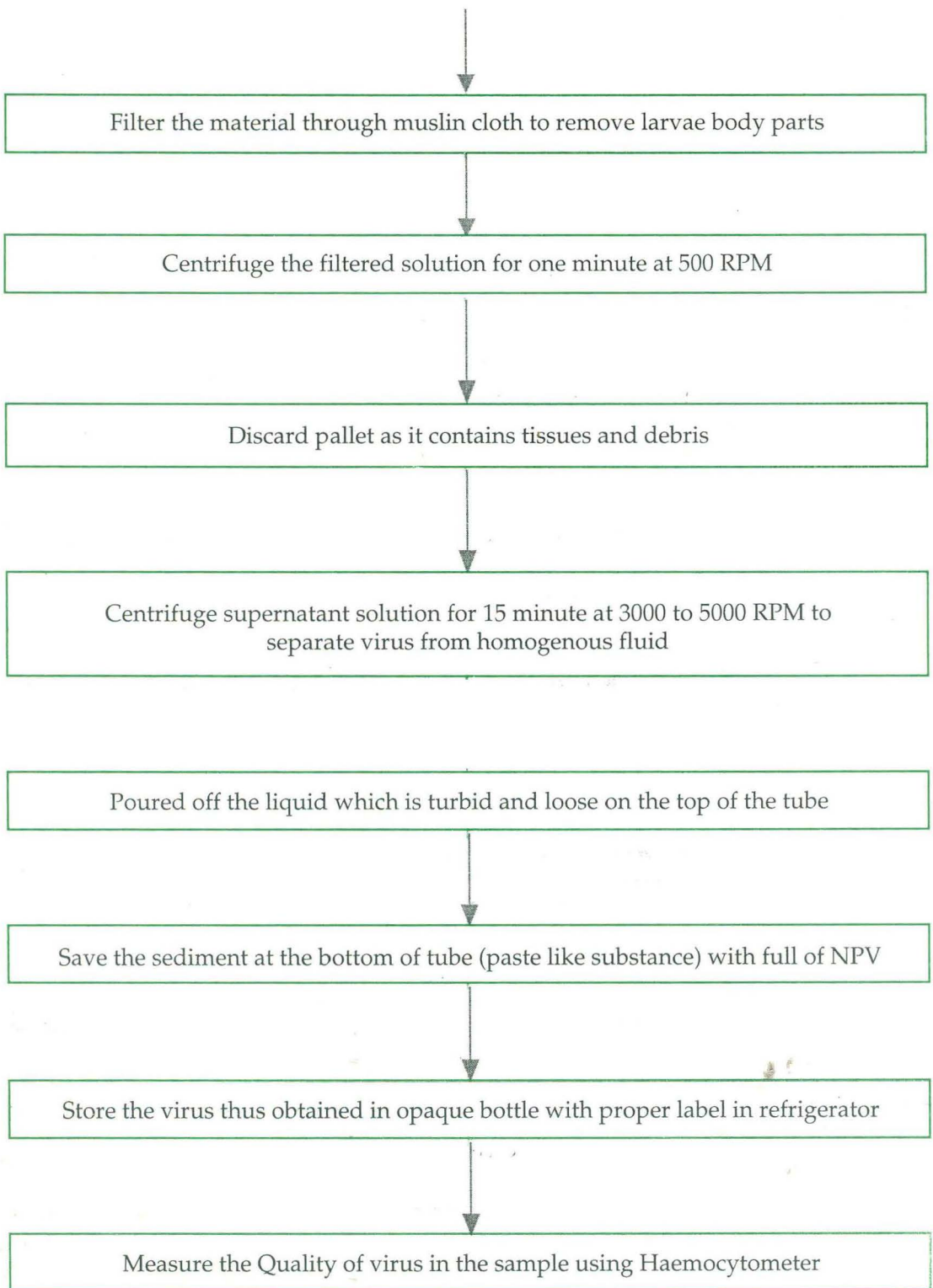
18. Drenching of hukka water, once in a week keeps various insect pests away from the nursery.
19. Spraying of hukka water is also effective to control the pests on transplanted seedlings. Hukka water contains nicotine sulphate which possibly acts as controlling substance for caterpillars and other pests.
20. Spraying of juice from tadi (*Phoenix sylvestris*) tree diluted in 15 litre of water is found effective in order to prevent infestation from aphids.
21. *Ketaki* (*Agave americana*) and chilli are used to control diamond back moth. *Ketaki* leaves are beaten on a rock a couple of times, and then packed in a plastic packet. The packet is squeezed to get the juice from the leaves. About 200 g juice is mixed with a fistful of dry red chilli powder. A glass of water is added to this mixture. The mixture is stirred and further diluted in 14 litres of water. Spraying of this solution is sufficient for half a bigha (0.08 ha) land:
22. It is a common practice to sprinkle wood ash @ 20 kg/acre in kitchen garden on vegetable crops and to spread it around plants to ward off pests and to enhance nutrient status of the soil. Wood ash is a source of phosphorus for plants and it also acts as a physical poison causing abrasion of epicuticular waxes and thus exposing pests through desiccation. Ash dust acts as antifeedant for insects, causing dehydration in soft bodied insects ultimately leading to their death. Wood ash is dusted with hand or duster on seedlings in the nursery as well as on the young seedlings, which protect the plant from pest and disease attack.
23. Powders of neem and karanj are mixed with soil for the control of termite when field is prepared for sowing.
24. Rice starch and animal urine are spread for the control of biting and chewing type insects.
25. Ash and cow urine are used to protect cabbage plants from insect pests. Healthy seeds are kept in cow urine for 10-15 minutes before sowing.
26. Adults of diamond back moth can be attracted, collected and destroyed by lighting at night in the field with torch/light trap.
27. The diamond back moth and other small insects are controlled by spraying 40-50 litres of asafoetida extract. About 100-150 g asafoetida is boiled in 1 litre water for 10-15 minutes and sprayed after cooling with 40-50 litres water/ha. About 50-60% insects can be controlled by spraying this solution.

FLOW CHART FOR THE PREPARATION OF 4% NEEM SEED KERNEL EXTRACTS (NSKE) FOR ECO-FRIENDLY PEST MANAGEMENT



FLOW CHART FOR THE PREPARATION OF NPV





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graph TD; A[Haemocytometer counts Polyhedral Inclusion Bodies with the help of phase contrast microscope] --> B[One larval equivalent is 6 x 10^9 PIBS]; B --> C[Add absorbent Robin Blue @ 1 ml / litre spray solution and adjuvant (0.5%) jaggery to improve the effectiveness of NPV]; C --> D[Spray NPV in evening hours @ 250 LE / ha and cover entire crop];
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Haemocytometer counts Polyhedral Inclusion Bodies with the help of phase contrast microscope

One larval equivalent is 6×10^9 PIBS

Add absorbent Robin Blue @ 1 ml / litre spray solution and adjuvant (0.5%) jaggery to improve the effectiveness of NPV

Spray NPV in evening hours @ 250 LE / ha and cover entire crop

Contact for Training and consultancy on -

- Training methodology for trainers
- Impact analysis and evaluation
- Development of project proposals
- Integrated farming system and
- Low cost eco-friendly pest management
- Agricultural and allied enterprise building for economic empowerment
 - Organic farming
 - Floriculture, Vermiculture, Vermicomposting and Apiculture
 - Ornamental fisheries and backyard pisciculture
 - Post harvest storage and value addition of fruits, vegetables and flowers
 - Quality seed production
 - Phenyl making, coir toys making, chalk making and candle making

For any information please write to:

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