Review of Literature

The use of naturally occurring plant products have assumed a special importance in the present strategy of developing environmentally sound methods of pest control vegetable oil treatment of grains to prevent breeding of stored product insects has been in practice in India since long (Mummigatti and Raganthan, 1977). Plants are the richest source of renewable bio – active organic chemicals. The total number of plant chemicals may exceed 4,00,000. Of these 10,000 are secondary metabolites whose major role in the plants is reportedly defensive especially against insect pests because the overall pressure of insects in the plants is much more than any other animal as there is hardly any plant which is not attacked by insects (Swain 1977). However the survey of literature indicates that very little work has been published in the effectiveness and feasibility of using vegetable materials such as oil, extracts and powder against insect pests of crop plants. The available literature on this aspect is presented in this chapter.

Kashyap *et al.*,(1974) reported that mixing powdred leaves of *Pudina*, *Mentha spicata* with wheat seeds at the rate of 0.5, 1.0 and 2 percent caused 10 – 16 percent mortality at the lowest and 56 – 72 per cent at highest concetration after 48 hours in case of *Sitophilus oryrae* L. while mortality after 96 hours was 71 – 100 percent and 100 per cent respectively.

Deshmukh and Borle (1975) screened twenty, plant materials for their insecticidal properties in the form of aqueous extracts (Extracts – A) and absolute alcoholic extract (Extract – B) against two different species of insects viz., *Prodenia litura* Feb. and *Dactynotus Carthami* H.R.L. Out of these plant materials the aqueous suspension of two plant materials and the cold alcoholic extracts of seventeen plant material gave some kill of the test insects.

Dongre and Rahalkar (1978) reported that the leaves of the *Xanthium stramonium* were totally rejected as food by *E.Vittella* F.larvae even in absence of its natured food and that the solvents ether extract of leaves showed strong antifeeedants activity when applied to leaves of Empire glandless (*Gossypium hirsutum*), an ideal food substrate for this insect. It is generallu known that in many insect species the ovipositional prefernce of newly hatched lervae (Meisner et al.1974). Dongare and rahalkar (1984) evaluated the deterrent influence of *Xanthium stramonium* leaves extract on oviposition by *E.Vittella* F.

Webb *et al.,*(1983) evaluated aqueous solution of neem seed extract applied on the leaved for antiovipositional and insecticidal effects againsts the leafminer *L. sativa* and *L. trifolii* and found significantly fewer eggs of *L. trifoii* in neem treated foliage than in water treated foliage such as differences in oviposition was not seen *L. sativa.* However, larval mortality of both species shortly after hatch was higher (100 per cent for *L. trifolii* 98.2 per cent *for L sativa*). Similarly, 0.1 % neem extract applied on chrysanthemum leaves showed that adalts of *L. trafolii* were slightly inhibited form making ovipositor punchers in leaves contrasted with the control leaves which contains numerical mines.

Barakat *et al.,* (1986) studied both acetone and diethyl ether extracts of some plants against eggs and adults of *Tetranychus urticace* Eggs were less affected than adults, but extracts of *D. Stramonium and Lupinus termis.* (Gennadius), leaf hopper. *Tacobiasca lybic*a (Bergevin) and aphid *A-gossypii* infestation on potato crop. While neem leaf extract gave a similar result with leaf hopper only.

Fagoonee (1987) evaluated neem seed kernel (NSKE) on four vegetable crops, viz., Chinese cabbage (*Brassica chinesis*), cabbage *(Brassica oleracea* var. botrytis) and tomato *(lycopersicon esculentum*). NSKE was found to be as effective as decis in protecting all the crops against their major pests like diamond back moth. *Plutella*

zylostella(Linnaeus) and cabbage webworm Crocidolomi binnotalis(Zeller) NSKE alone, howevere, did not afford sufficient protection against *H. aremigera* but when alternated with decis on weekly basis it gave better result than decis used alone.

Shin – Foon (1987) reported following plants as source of insecticide for management of vegetable crops. Seed oil of *Melia azedarach* gave effective control of citrus red mite, *Panonychus citri* (Mc Gregor) on citrus. The efficacy was comparable to potent acaricide amitraz. The seed oil also gave effective control of whitefly. *Aleurocancthus spiniferus* (Quaintance).

Gujar and mehrotra (1988) reported that under no choice condition feeding of adults of *A.foeicollis* for a period of 11 days on leaves of musmelon treated with 0.5 – 2 percent NSKE led to nearly 50 per cent mortality within 4 – 7 days. Whereas there was no mortality of adults when fed on as high as per cent neem oil.

NSKE and aqueous seed kernal extract of *M. azedarach* at 0.4 per cent concenteation significantly reduced the feeding by *P. brassicae* larvae. The larvae when fed for six days on cabbage leaves treated with 0.4 per cent NSKE and aqueous extract of fruit of *M. azedarach* suffered 100 and 82.9 per cent mortality respectively within six days (Sandhus and Singh, 1975). Singh *et al.* (1988) reported ethanolic extract of hexane extract of neem seed kernel as an effective insecticide against mustard aphid, *Lipaphis erysimi* (Kaltenbach).

Narasimhan and Marippan (1988) reported that the seed oil of *Annona squamosa* in water emulsified with 1 % teepol was effective against rice tungru virus which was transmitted by leafhooper. In the present investigation, the leaf extract of *Annona squamosa* was effective against leafhopper of okra.

Ayyangar and Rao (1989) reported that methanol and hexane extracts of neem kernels were tested for their repellent and ovipositional deterrent properties against the larvae and adults,

respective of *spodotera litura*. In general, the methanol extract was superior to hexane extract as it elicited greater repellency to different larval stages ay lower concentration (0.02 %) than hexane extract (0.045 %). The percentage repellency increased with successive in star at the same concentration. During the present investigation, the extract prepared in the solvent viz., acetone and hexane were tested under laboratory conditions and were found effective. Howerver the extracts prepared in hexane showed slight phytotoxicity.

Saito *et al.*,(1989) prepared and screened a total of 240 extracts (in hexane, acetone and ethanol) of 30 species of Brazilian plants, for their insecticidal activity against adult of *Musca domestica*, *Ceratitis capitata*, *Zabrotes subfasciatus* and *Anthonomus grandis* and larva and *Sodoptera frugiptera*. Only extracts of seeds of *Annona cacans* and *Annona squamosa* showed low insecticidal activity.

Sordana and kumar (1991) reported that 2 percent neem oil spray was as effective as 0.05 percent monocrotophos.

Dhawan and Simwat (1992) stated that the extracts of *Azdirachta indica* (Neemark at 1250 ppm and 1875 ml / ha and Indiara NE 20 EC at 625 and 1250 ml/ ha combined extracts of *Azdirachta indica*, *M. longifolia*, *P. pinnata* (RD-9 Repelin to 100 E at 2500 and 5000 ml / ha) and dimethoate
(Roger 30 EC) were evaluated for the control of sucking pests on upland cotton (Var. F414). Population of pests was significantly reduced RD-9 Repelian giving similar result as that of dimethoate and both these treatments were better than neemark.

Koshiya and Ghelani (1993) gave an account of antifeedent activity of various plant extracts against 3 rd instar larvae of *spodoptera litura* on groundnut in laboratory at 26°C. The neem leaf and seed extracts were found highly effective giving 75.5 per cent and 88 per cent concentration.

Patniak (1997) tested six formulations of neem against two tamato pests, *L .tritolii* and *S .litura* on tomato in Orissa, India in 1995-1996 and found that multineem was most effective reducing leaf infestation by 82.2 per cent and nemazol waseffective with the reduction in infestation of 73.1 per cent. However, yields in treated plots were lower than those in untreated ones suggesting possible adverse effect on fruit setting.

More *et al.* (1989) reported that the toxicities of aqueous and alcohol extracts of ten plant species to larvae to *Spodoptera litura* were evaluated in the laboratory each at 1, 2, 3 and 4 per cent and mortality was determined 24 and 48 hrs after treatment. The aqueous and alcoholic extracts of *Vitex negundo* was the most effective perticularly at higher conc. and after 48 hrs.

Hiremath *et al.* (1997) studied the insecticidal activity of the Indian plant extracts against *Nilparvata lungens.* They reported that the seed extract of *Annona Squamosa* exhibited significant activity. However, in the present investigation 100 % reduction in the population of leafhooper of okra was obtained in 3 % leaves extract of *Annona squamosa.*

Sahayaraj and Gabriel, Paulraj (1998) studied the efficacy of neem leaf extract of different concentration (0.5, 1, 2, 4 and 6 per cent) against the fifth instar of *Amsacta albistriga* Walker in the laboratory. Mortality was recorded for every 24 hrs for a period of 96 hrs. The result showed that larval mortality increased form the lower concentration to the higher concentration (8.33, 13.33, 23.33, 66 and 85.7 for 0.5, 1, 2, 4 and 6 per cent respectively). Lowest concentration caused 22.73 per cent pupal mortality. Other concentrations did not affected the pupal stage.

Murugan and Jeyabalan (1998) studied the effect of neem kernel extract (NSKE) in combination with NPV and *Bacillus thuringiensis* Kurstaki (Btk) on *Helicoverpa armigera* Hubner. *H. armigera* Hubner. *H. armigera* larvae were mass reared on cotton leaves. Food consumption

and weight gain were recorded in the third instar larvae. Fecundity was studies on VI instars larvae. Results shows that neem seed kernel extract enhanced the activity of NPV and Btk to great extent and suppressed the overall consumption, fecundity and survival of *H. armigera.*

Murungan *et al.* (1999) studied the toxicity effect of certain plants on *Spodoptera litura* Fab. Feeding deterrent and toxic effects of certain plant extracts on fifth instars *S.litura.* The results showed that crude ethanolic extracts of *C.gigantea, D. metal, N. oleander, V. rosea A. vera A. squamosa* and *P. pinnata* had high toxic effect on *S.litura.* But, neem seed kernal extract had higher antifeedancy and less toxic effect. For effective pest management combinaton of neem and other botanicals in appropriate level will be useful to increase the pesticidal activities.

Chinniah (1999) was conducted field study to test the safety of neem derivative to mite predators, *Amblyseius* sp.in a cotton ecosystem. The results revealed that all the there neem derivatives viz., neem cake extract 5 % neem seed kernal extract 5 % and neem oil 3 % were safer to the predatory mite, compared to methyl demeton 0.05 %.

Parihar (1999) studied the different plant extracts like neem (*Azdirachta indica*), tulsi (*Osimum sanctum*), safeda (*Eucalyptes spp.*) and haldi (*Curcuma longa*) against peach aphid, *Myzus persicae*(Sulzer) in laboratory. The leaves of above plant were collected, dried under shade and powdered. Aqueous extracts were using the powdered leaf material and distilled water at 1, 2 and 3 per cent concentrations. The leaves of potato were dipped for ten minutes in the aqueous leaf extracts and twenty aphids were on these leaves. Observation were made on per cent mortality at 24, 28 and 72 hrs of release. Neem leaf extract at 1 per cent had lowest mortality while it recorded highest per cent mortality at 3 per cent. Out of four plants tested against aphid neem ranked first followed by Safeda.

Oudhia (2000) studied toxicity effect of different concentration of *Parthenium hysterophorus* leaf extracts (PLE) on *Aspidomorphs miliaris* F. and *Zonabris pustulata*. *P. hysterophorus* leaves were collected before flowering and allowed to decay in the distilled water in different ratio 1:10, 1:12.5, 1:15, 1:15.5, 1:20, 1:22.5 and 1:25 w/v of plant material and water, respectively. Higher mortality (55 %) was noted in 1:10 PLE as compared to rest of the treatments

Red Spider Mite

In Indian literature, spider mites were never reported as a pest of agriculture prior to 1940 (Prasad, 1974). With the introduction of different broaad spectrum insecticides such as organochlorine and organophosphates for general pest control, the natural enemies of mites were adversely affected. The regular intervention of insect pest populations with chemical insecticides resulted in serious outbreaks of mites. In addition, the deleterious effects of these insecticides caused negative and adverse impact on biodiversity by reducing the overall population of natural enemies and variety of other beneficial, biological species. Thus mites assumed a status of major pest with recurrent occurrences on many vegetables and other crops. Consequently, major insect pests including mites have acquired resistance to many pesticides. The mite have acquired single / cross / multiple resistance to almost all commonly used acaricides.

The spider mites have very short life cycle and the number of generation under favourable conditions are very high. Due to very high reproduction rate and ability of quick development of cross multiple resistance to different compounds, their management has become a more difficult task in recent years problem for crop.

Like spiders, the mites spin webs, on the leaves and cover their colonies to protect themselves form natural enemies and also from

pesticides. Overcrowding of the mites of ten occurs on leaf and fruit tip and consequently they migrate o other fields. Besides the tomato most of the vegetable crops re subjected to attack of the spider mites and common species prevailing are *Tetranychus innabarinus* (Borisduval ,*T .neocaledonicus* (Adre), *T.luden* (Zacher) and *T.macfarlanei* (Barker and Prichard). The yield loss due to the mites in tomato is 15 to 30 percent. Heavy infestation of *T.cinnabarinus* results in shedding of leaves with no fruiting and total failure of crop.

In India, earlier workers has recommended the use of lime sulphur (Rahman 1939), powder of wood ash plus sulphur at 4:1 (Puttarudridh 1947) ramite (seen 1958) Parathion (Pawar and Rathore 1959) Diazinon (Singh and Gruram 1960) etc. for controlling the spider mite infesting vegetable crops.

Earlier researches have advocated following pesticides against the tetranychid mites.

Pesticide	**Mite Species**	**Reseachers**
Parathindiazinon (0.03 %)	*T. telarius*	Lal *et al.* (1965)
Dicofol / malathin (0.025 %)	*T. telarius*	Bindra & Goyal 1965
Carbophenothion (0.02 %) / chlorobenzilate (0.082 %) / lime sulphus (0.051 %) / dicofol (0.031 %)	*T. urticae*	Basue & Pramanik 1965
Dimethoate (0.05 %) Phosphamidon (0.025 %)	*T. cucurbitae*	Atwal *et al.* (1969)
Dimethoate / diazinon (0.025 %)	*T. telarius*	Bapu *et al.* (1970)
Methyl demeton / chlorobenzilate (0.025 %)	*T. cucurbitae*	Sidhu and singh (1971)
Chlordimeform / dicofol (0.025 %)	*T. cucurbitae*	Gupta *et al.* (1972)

Dimethoate / monicrotophas (0.025 %)	*T. cucurbitae*	Singh *et al.* (1973)
Cholrdimeform (0.02 %) Traind (0.03 %) Cyhenath (0.1 %)	*T. Cucurbitae*	Krishniah & Tandon (1975)
Disulfoton at SG (1.5 Kg/ha)	*T. neocaledonicus*	Dhooria *et al.*(1976)
Dicifol (0.03 %)	*T. neocaledonicus*	Pande & Sharma (1980)
Oxysemeton – methyl (0.025 %)	*T. cinnabarinus*	Dhooria & Bindra (1980)
Dimethoate, ULV Formulation	*T. cinnabarinus*	Dhooria & Mann (1980)
Cabaryl (1 KG / ha)	*T. cucurbitae*	Dilbagh & Gill (1981)
Carbaryl (0.2 %)	*T. telarius*	Patel *et al.* (1982)
Marathon (0.1 %)	*T. telarius*	Goyal (1982)
Dimethoate / Phosphamidon (0.03 %)	*T. Neocaledonicus*	Sulbha Rao *et al.* (1984)
Dicofol (0.03 %) Ethion (0.1 %) Sulphur (0.2 %)	*T. telarius*	Shah *et al.* (1989)
Selvisuph (0.15 %)	*T. cucurbitae*	Kumar *et al.* (1889)
Lyhexatin (0.03 %) / Sculpture (0.15 %)	*T. cucurbitae*	Yadav *et al.* (1989)
Neem seed kernal Extract (0.2 %)	*T. urticae*	Devraj Urs (1990)
Dimethoate (0.03 %) Sulphur (0.2 %)	*T. cinnabarinus*	Kaneria & Bharodia (1991)
Dicofol (0.04 %) Followed by Endosulfan (0.05 %) Phosphomidon (0.025 %)	*T. cinnabarinus*	Verma (1992)
Namark (0.5 %) / Margocide (0.1 %)	*T. cinnabarinus*	Patel *et al.* (1993)
Carbaryl (0.15 %) Plus dicofol (0.036 %)	*T. neocaledonicus*	Sudhakar *et al.* (1998)

In India earlier workers used plant originated pesticides.

Barakat *et al.* (1986) studied both acetone and diethyl ether extracts of some plants against eggs and adults of *Tetranychus urticace.*

Eggs were less affected than adults, but extracts of *Piper nigrum* and *Datura stramonium* showed considerable ovicided propertied. Adult were most affected by extracts of *D. stramonium* and *Lupinus termis.*

Plant originated pesticides are the oldest pesticides used by man. In ancient time man used the neem leaves for grain and cloth protectent against insect pests. So the pesticides prepared from the plants like for e.g. Neem (*Azadirachta indica* A. Juss, Nirgudi. (*Vitex negundo*), Yellow Datura (*Argemone maxicana* L.) Castard apple (*Annona squamasa* L.) are beneficial and free of cost.

Whitefly

Records of hosts colonized by *B.tabaci* in the New world from 1900 to the present

Years	Crop plant	Plant family	Continental or Sub continental location
1930S	Bean	Leguminosae	Caribbean Basin, central America Mexico & South America.
1950S	Bean Cotton	Leguminosae Malvaceae	Brazil, Us and Venezuela
1950S – 1960	Bean Cotton Okra & Tabacco	Legyminosae Malvaceae Solonaceae	Caribean Basin Cental America, Mexico, South America & US.
1960S	Bean Tomato	Leguminosae Solonaceae	Caribbean Basin Venezuela

1970S toearly 1980S	Cucurbits Cotton Tomato	Cucurbitaceae Malvaceae Solonaceae	Mexico & US
Mid 1980S	Bean Beet Lettuce Cotton Carrot Potato	Leguminisae Chenopodiaceae Compositae Malvaceae Umbellifeerae Solanceae	Mexico Mexico &US
Mid 1980S to 1988	Beat Cucurbits Bean Cotton Tomato and Peper	Chenopodiaceae Compositae Cucurbitaceae Malvaceae Solanceae	Venezuela Caribbean Basin, Eastern Caribbean, Mexico, and US.
1988 to Present	Beet Lettance Cole corps Cucurbits Bean & soyabean Cotton Pepper, tomato, egg plant & tobacco Carrot Lantana	Chenopodiaceae Compositae Crecisitae Cucurbutaceae Leguminosae Malvaceae Solanaceae Umbelliferae Verbenaceae	Central & South America, Caribean Basin, Estern Caribean Mexico & US

In Indian earlier workers used plant originated pesticides. In ancient time some scientist used plant part for the control of pests.

Siddiq (1987) evaluated NSKE and neem leaf etracts at a concentration of 1 kg / 40 litre water against potato pests. NSKE significantly reduced whitefly, *Bemisia tabaci* (Gennadius), leaf hopper. *Jacobiasca lybica* (de Bergevin) and aphid, *A- gossypii* infestation on potato crop, While neem leaf extract gave a similar result with leaf hopper only.

Men *et al.* (1999) studied vertical distribution of whiteflies, *Bemisia tabaci* Genn. Seed were *dibbed* at 45 x 22.5 cm in eight plots of 1.8 x 2.7 m each. Recommended package of practices were recorded when whiteflies poplation attained peak. Significantly highest population was observed on upper leaves (48.67%) follwed by middle two leaves (31.76%) and lower two leaves (19.55%).

Whitefly has been a serious pest on agricultural and horticultural crops. So need of the management is essential. Nature has been the biggest architect of heterogenous chemicals especially In case of plant kingdom where they have been used to ward off unwanted insects. Insects possess specialized receptory cells which are more sensitive than our electronic analytical instruments, and thus they choose a proper food plant for themselves.

Therefore the plant products or their for crop protection. Plant originated insecticideare the cheapest safe effective & above all environmentally acceptable pest control agents. So we use some weeds.