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Evaluation of Synthetic and Some Plant Origin Insecticides Against *Helicoverpa armigera* (Hubner) on Chickpea

Akbar Ali Rajput, M.Sarwar, Moula Bux and M.Tofique
Nuclear Institute of Agriculture, Tandojam-70060, Pakistan

Abstract: Field experiment was conducted to test a synthetic insecticide and insecticidal properties of four selected plant origin materials at the experimental farm, NIA, Tandojam. Insecticidal effects of these products were assessed against *Helicoverpa* species on chickpea crop and compared with control. After treatment, counts for larval mortality and percentage pods infestation were made at 24 and 72 h intervals. Our experimental results showed that over all pods infestation percentage and seed yield in treated plots were significantly higher than the untreated plots. However, as it is evident from the data the synthetic product gave the best results than all the sets of natural products for the parameters studies.

Key words: *Helicoverpa armigera,* chickpea, synthetic

Introduction

Despite the wide acceptance and use of the modern insecticides; insects introduction through trade, upsets of balances of nature and development of insect resistance are the factors accentuating the insect menace in the environment. Both producers and consumers of agricultural products have become more aware of the environmental and potential health hazards associated with heavy use of conventional insecticides. This awareness has contributed to the rise of alternative farming system, one approach to the control of insects is the use of biodegradable natural plant products. Since, the discovery of plant origin materials having insecticidal properties encouraged and constituted outstanding development of numerous substitutes of synthetic compounds in a steadily increasing demand for botanical pesticides. Need is being felt, in the use of these biopesticides, their firmly establishment, methods of manufacturing and standardization within the past few years. Some plant materials furnish some of the most widely used insecticides, their flowers, leaves or roots may be finally ground and then used in this form or the toxic compounds may be extracted and utilized alone or in combination with other toxicants and auxiliary material. Tobacco, pyrethrum, derris, hellebore, quassia, camphor and turpentine are some of the important plant products, which were in use as insecticides many years prior to organize search for effective agents in this field (Shepard, 1951).

Helicoverpa armigera is the most important insect of chickpea (*Cicer arietinum* L.) which is a legume of economical importance grown in the hot climates. Synthetic insecticides are often used to suppress this pest because of their availability, portability, potential for quick intervention and prevention of serious plant damage by larvae. This polyphagous pest is assuming the status of major insect, consequently, growers may be unable to rely solely on synthetic chemical control. Attention is being paid again to traditional practices of plant protection on small farmer's holdings in Pakistan like developing countries. Besides cultural practices, plant extracts are regaining interest for the control of this pest. Some studies have been conducted on the use of plant origin products against insects pests in general as by Atwal and Pajni (1964), Saxena and Srivastava (1972); Sudhakar *et al.* (1978), Tiwari and Pandey (1979), Pandey *et al.* (1979), Sundramurthy (1979), Chandel *et al.* (1984); Li and Foon (1987), Mukherjee and Ramachandran (1989), Rovesti and Deso (1991), Prasad (1994) and Gilani 2001. Some studies were concerned with the determination of effects of such products against noctuid insects conducted by Matsumota and Yushima (1960); Redferen *et al.* (1980); Meisner *et al.* (1981); Koul (1985) and Prabhakar *et al.* (1986); but very few studies have been taken and published pertaining to *Helicoverpa* in particular like Pandey *et al.* (1983); Singh *et al.* (1985) and Hu *et al.* (1993).

Materials and Methods

In this study, the status of botanical pesticides namely, Neemokill *Azadirachata indica* (T1), Neem peth ether (T2), Turmeric *Curcuma longa* (L.) (T3) and sweetflag *Acorus calamus* (L.) (T4) alongwith a synthetic insecticide Sanital (T5), and check (T6) for using against *Helicoverpa armigera* was assessed at NIA experimental farm, Tandojam. Formulation of botanical pesticides were

obtained from PARC, Islamabad, stored grain management research laboratory, Karachi. Formulations of commercial insecticide was available which can readily be used in the field and were considered closer to existing application conditions and were expected to produce results comparable in the field. Synthetic insecticide and plant origin products were used according to the standard spraying method over the crop under the similar conditions.

Commercial cultivar, CM-1918 was sown on 20-10-2001 in randomized complete block design (RCBD) with 3 x 2 m plot size having three replications during 2001-2002. All the recommended agronomic practices were adopted on the crop. After the sprayer was calibrated the pesticides were applied twice, first at flowering stage and second at pod formation stage of crop. The Larval population under the trial was recorded from each plot in the morning at pretreatment and then mortality counts data was obtained after 24 and 72 h of post application treatment. Data on pest population was recorded from 4 m row length randomly selected from each treatment. Finally, the population data was presented in the form of mean values for each repeat treatment of every test materials. Toxicity of various products was assessed by considering the pest population, pods infestation percentage and yield reflected by the treated plots. Besides the mortality effect of products used, their effects were also studied on the crop yield. Data so collected was analyzed statistically.

Results and Discussion

The mean data regarding seasonal larval population of *Helicoverpa armigera,* percentage pod infestation and grain yield are presented in the Table 1. Over all pest population and crop yield were significantly higher in the treated plots as compared with control (untreated) plots. Among the treatments, the lowest population and the highest yield were observed in synthetic product than the plant origin products, throughout the observation period. Sublethal effects were manifested by the natural products on both the parameters under study. However, it is revealed that after spraying; sanital, neem pet ether, sweetflag, neemokill, turmeric and check treatments supported 2-3 larvae per meter before treatment, but at post treatment overall population was significantly lowered in treated plots as compared to untreated plots; as 3.25, 8.60, 10.25, 12.33, 15.50 and 25.75 % pods infestation, respectively, by yielding 1760-0, 1350.0, 1630.0, 1410.0, 1520.0 and 1313.33 g per 6 sq. m of the crop plant, respectively. So, sanital has given the best control of the test insect pest, neemokill showed the least result, while neem pet ether, turmeric and sweetflag were at par and equitoxic giving non-significant results in harbouring insect population. Seed yield was significantly higher in plots treated with sanital, sweetflag and turmeric insecticides. Maximum yield was obtained with sanital followed by the previous two. The yield differences between neemokil, neem pet ether and untreated plots were non significant. Data presented indicated that although the neem products contributed towards pest reduction, but lost its efficacy after treatment and pest population there after increased.

Among botanical insecticides, better results exhibited by neem product (neem pet ether) may be due to two reasons: I) Due to repellency of the larvae of different instars on the leaves from the treated and untreated plants by neem product, consequently, lower number of larvae were recorded on the leaves from the sprayed plants than on the leaves from untreated plants. ii) Due to the antifeedant effect on the larvae, there were some differences in feeding rates by the larvae on treated and control leaves, indicating that neem product exhibited antifeedant properties. This finding is in agreement with the observations of Gilani (2001) who reported that neem plant extracts repel insects and deter their feeding. Growth and development of insects are disturbed when feed on material treated with its extracts. Redferen *et al.* (1980) reported that neem compound *Azadirachtin* has effect on insect feeding. Meisner *et al.* (1981) and Koul (1985) also demonstrated that this compound has been shown to have insect repellent and antifeeding effects on a number of agricultural pests. Saxena and Srivastava (1972) used *Acorus calamus* extract as insecticide and reported the best results. Pandey *et al.* (1983) gave the results that *Acorus* gave 72.22% mortality to *Heliothis* larvae. Gilani and Saxean (1990) monitored repellency of oils of turmeric, sweetflag, neem and a neem based insecticide; turmeric and sweetflag oil were significantly more repellent during the first 2 week than neem products, but thereafter, their repellency decreased more rapidly than that of neem products because of greater persistence. Results of present experiment also seems to be in accordance with those reported by Tiwari and Pandey (1979), Pandey *et al.* (1977, 1979), Chandel *et al.* (1984), Rovesti and Deso (1991) and Gilani (2001), where there was provided that some plant extracts gave the antifeeding repellent and insecticidal influences. Spray application of synthetic insecticide (sanital) reduced the infestation of *Helicoverpa* and led to the pod yield higher than for botanical insecticides. Singh *et al.* (1985) also determine the same results that neem extracts offered less protection than synthetic insecticides which was highly affected against this pest. Similar results were obtained by Prasad (1994) who reported that synthetic insecticide was superior in controlling the insect pest than the neem products.

Table 1: Efficacy of different botanical pesticides for the control of *Helicoverpa armigera* (Hubner)

Treatments	Larval population per meter row before treatment	Larval population per meter row after first treatment	Larval population per meter row after 2nd treatment	Pods infestation (%)	Grain yield of 6 sq.m (g)
Neemokill 60 EC	3.00a	1.33b	1.00bc	15.50b	1410.0d
Neem pet ether	2.00a	1.67b	0.67bc	8.60d	1350.0de
Turmeric (P.E)	2.67a	1.67b	1.00bc	12.33c	1520.0c
Sweetflag	2.00a	1.33b	1.33b	10.25cd	1630.0b
Sanital 20 EC	2.00a	1.00b	0.00c	3.25e	1760.0a
Untreated control	2.33a	4.00a	2.67a	25.75a	1313.33e

Results of this study led to conclusion that all the botanical and synthetic insecticides contributed in reducing the *Helicoverpa* population over the untreated plots. Nevertheless, the synthetic chemical is still reckoned to be better solution against the ravages should be undertaken to locate effective concentration of poisonous plant's products, alongwith their right time of application; which uptil now still needed to be explored.

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