Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.4, No.7, 2014

Efficacy of Neem Kernal Powder and Neem Oil against *Helicoverpa Armigera* on Sunflower Crop

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Abstract
A field study was carried out during 2013 at the experimental area of Sindh Agriculture University Tandojam during, in RCBD to exmine the efficacy of neem kernal powder, neem oil and Radaint against *Helicoverpa armigera* on sunflower crop. Four treatments with T1=Neem kernel powder, T2=Neem oil, T3=Radiant and control (Untreated). Variety HO-1 was sown on 1st March 2013. The experiment replicated three times. The results reveled that biopesticides and synthetic pesticides were sprayed against *H. armigera* on the sunflower crop. The plots treated with radiant showed heighest efficacy (52.60%), followed by the plots treated with Neem seed kernel extract (31.32%) and the plots treated with Neem oil (30.14%) was recorded after 1st spray on sunflower crop. In the second spray the plots treated with radiant also showed heighest efficacy (57.30%), followed by the plots treated with Neem seed kernel extract (33.34%) and plots treated with neem oil (32.27%) was recorded on sunflower crop. However, in 3rd spray the heighest efficacy was recorded in the plots treated with radiant (50.48%), followed by the plots treated with Neem extracts (40.39%) and plots treated with neem oil (36.40%) was recorded. While, in fourth spray, the heighest efficacy was recorded the plots treated with Neem extracts (42.60%), followed by the plots treated with Neem oil (31.40%) and plots treated with Radaint (39.40%) was recorded on sunflower crop. The overall results showed that the biopesticids reduced *H. armigera* population progressively, as compared to synthetic pesticides.
Keywords: Sunflower, Helicoverpa armigera and Neem Products

INTRODUCTION:

Sunflower is one of the four major important oilseed crops (soybean, peanut, rapeseed and sunflower) globally and is grown on over 23.31 million hectares worldwide, with a production of 29.90 million tones (Shirshikar, 2005; Skoric *et al.,* 2007). In Pakistan, sunflower is planted on about 0.363 million hectares in the four provinces. It is grown twice a year (spring and autumn) in Sindh, Pakistan (PARC, 2007). Sunflower seeds contain 40% oil content of high quality with low cholesterol, easy to refine and contains fat soluble vitamins A, B, E, and K. It is quiet good for heart patients. (Evertt *et al.,* 1987*;* Goasal *et al.,* 1988). Low yield of sunflower may be attributed to several reasons such as occasional adverse climatic conditions, poor agronomic methods of cultivation, non-availability of improved seed, prevalence of diseases and damage caused by pests (Burney *et al.,* 1990). The insect pests ravaging this crop include cutworms *(Agrotis* spp.), green stink bug (*Nezara viridula* linnaeus), American bollworm (*Helicoverpa armigera Hubner*), cotton aphid *(Aphis gossypii* Glov), potato aphid (*Macrosiphum euphorbiae* Thos), cabbage semi-looper *(Plusia orichalcea* (Fabricius), caterpillar *(Perigea capensis* G), jassid (*Amrasca devastans* Dist), whitefly *(Bemisia tabaci* Gennadius), yellow flower thrips *(Frankliniella sulphurea* Schmutz), and sawtoothed beetle *(Oryzaephilus* spp.). Among all these *H.armigera* is serious pest of sunflower crop in reducing the yield (Aslam *et al*., 2000 and Rafiullah *et al.,* 1998). *Helicoverpa armigera* (Hübner) are important polyphagous pests of cultivated crops primarily in tropical and subtropical regions. *Helicoverpa armigera* (Hub.) is a major pest of important crops and vegetables in Pakistan (Ahmad *et al*., 1989). It has been recorded to damage more than 100 plants species including cultivated and non cultivated plants of 39 families across the world (Reed and Powar, 1982). Host species for *H. armigera* come from a broad spectrum of families and include important agricultural. It invades and voraciously feeds on cash crops such as cotton, maize, chickpea, pigeonpea, sorghum, sunflower, soyabean and groundnuts around the world (Fitt, 1989). The indiscrimination use of chemical poisons has disturbed the natural ecosystem and the natural balance ratio of pests and its natural enemies. The pesticides do not kill the pests alone but also destroy the predator; parasites, animals, birds, and some time human being get seriously affected while using the spray material. The pesticides are the only readily available source for destroying pest population in many developing countries (Lohar. 2001).
Bio-pesticides substances that plants produce from genetic material that has been added to the plant. Bio pesticides are naturally occurring substances that control pests by non-toxic mechanisms (Thakore, 2006). Botanical extracts induce insecticidal activity, repellence to pests, antifeedant effects and insect growth regulation (Prakash and Rao, 1997). *Neem d*erived from the neem tree *(Azadirachta indica)*, this contains several chemicals, including 'azadirachtin', which affects the reproductive and digestive process of a number of important pests (Kalra and Khanuja., 2007). Various neem formulations to determine their effectiveness for the control of some major pests of eggplant, *Solanum melogena* (L), okra, *Hibiscus esculentus* (L) and (*Helianthus annuus* L.). Various concentrations of neem emulsion reduced incidence of *Selepa docilis* (Butler), *Urentius* sp.

and *Zonocerus variegatus* (L), on eggplant. Damage caused by *Sylepta derogata* (F), defoliator of okra, was less in plots treated with 5, 10 and 20% aqueous-methanol extracts of defatted neem cake. Moreover, neem seed cake applied as dust enhanced sunflower yield (Cobbinah and Osei-Owusu 2001). Srinivasan and Babu (2001) reported that the all the neem products tested gave effective control of fruit borer. However, Neem Azal F, Nimbecidine, Neem Gold and NSKE 5% performed better than other treatments recording lower mean population of 0.1, 0.4, 0.6 and 0.1, respectively, as against 5.7 per five plants in control after three rounds of spraying. It has been reported by various scientists that neem products have several biological effects on insects (Zehnder *et al.* 1988). Neem seed kernel extract and profenofos + cypermethrin resulted in the lowest fruit damage (23.88%), whereas single application of profenofos 50 EC 0.1% resulted in the highest total fruit yield (388.80 q/ha) (Kaur, 2004). The proposed IPM strategy will be useful information for the management of *H.armigera* on sunflower crop.

MATERIAL AND METHIOD

An experiment was carried out to assess the efficacy of neem kernal powder and neem oil against *Helicoverpa armigera* on sunflower crop at the experimental area of Sindh Agriculture University Tandojam during 2013.
Four treatments such as T1= Neem kernel powder, T2= Neem oil, T3= Radiant and control (Untreated) was evoluted against the *H. arimgera* on sunflower crop. Varirty HO-1 was sown on 1st March 2013 for this purpose. The experiment was laid out in a Randomized Complete Block Design with four treatments and three replications, in a field measuring about plot size was 1245m² (12 ghuna) and sub plot size was 207m² (2 ghunta). For this purpose, eight kilogram mature and healthy *Azadirachta indica* seeds were collected from market and pulp of the seeds was removed initially and shade dried; later seed coat was removed from the dried seeds and the kernel was powdered by using mortal and pestle. Sixteen hours before spraying, botanical extract was prepared from the powder. According to this procedure to prepare 5% concentration was dissolved in 15 liters of water and used to spray on the above mearing field. The neem oil and synthetic pesticide “Radiant" was obtained from the market. The Radiant applied with the dose of 80 ml per/ acre and the neem oil 800 ml/acre mixed with 20 gm of surf detergent were sprayed against *H.armigera* as compare with untreated control. For recording observation on population of *H. armigera* twenty five plants were selected randomly from each sub plot and tagged were examined carefully and their average was workout. Three observations were taken for each application i.e. one a day before spray (Pre-treatment observation) and two observations after sprays (Post treatment) at the intervals of three and seven days. To see the efficacy of pesticides reduction percentage was calculated as per the standard formula of Hinderson and Titten (1955).

$$\text{Percent mortality} = 1 - \frac{Ta}{Tb} \times \frac{Ca}{Cb} \times 100$$

Where

Tb = Number of pest in treated plots before treatment.
Ta = Number of pest in treated plots after treatment.
Cb = Pest population in the control plots before treatment.
Ca = Pest population in the control plots after treatment.

The data thus collected were subjected to analysis of various to test superiority of treatment mean LSD test was applied as per the method outline by Gomez and Gomez (1984). For this purpose a Microsoft computer package “MSTATC” was used.

RESULTS

In order to evaluate the efficacy of different pesticides against *Helicoverpa armigera* on sunflower crop was carried out during the year 2013, at the experimental area of the Entomology Section, Agriculture Research Institute (ARI) Tandojam. The biopesticides and synthetic pesticide included T1= Neem seed kernal powder, T2= Neem oil, T3= Radiant and T=4 Control (Untreated). Sprays was done when *H. armigera* were apperead on sunflower crop, sprays were carried out in the months of mid April to mid June respectively. The results of present studies are given below:
The result on reduction %age of *H. armigera* recorded after three and seven days after 1st spray of different treatments are shown in the table-1. It may be seen from the results that the biopesticides reduce *H. armigera* population progressively, as compared synthetic pesticides. The Neem seed kernel extracts showed maximum reduction %age after three and seven day of 1st sprays as compared other treatments. The maximum reduction percentage was recorded in the plots treated with radiant (53.60%) and (51.00%) three and seven days after spray, followed by the plots treated with Neem seed kernel extract (30.64%) and (32.00%) and the minimum reduction percentage was recorded in the plots treated with neem oil (29.13%) and (31.15%) three and seven days after spray, respectively. The results also showed the maximum reduction %age was recorded after three days of spray.

Table 1 Mean and reduction %age of different pesticides against *H. armigera* on sunflower crop was recorded before and after different time intervals of 1st spray.

Treatments	Pre treatment Observation	3 Day After Spray	7 Day After Spray	Average
NSKE	2.76	51.64	57.00	54.32
Neem Oil	2.63	42.13	51.15	46.64
Radaint	2,83	61.78	59.79	60.79

The mean reduction %age of *H. armigera* of different treatments of 1st spray, showed the heighest mean reduction %age (52.6%) was recordrd the plots treated with radiant followed by Neem seed kernel extract (31.32%) and neem oil (30.14%) was recorded after 1st spray on sunflower crop.

Table 2 Mean and reduction %age of different pesticides against *H. armigera* on sunflower crop was recorded before and after different time intervals of 2nd spray.

Treatments	Pre treatment Observation	3 Day After Spray	7 Day After Spray	Average
NSKE	2.23	56.37	59.63	58.00
Neem Oil	2.36	46.40	50.76	48.58
Radaint	2.16	66.21	70.82	68.52

The result on reduction %age of *H. armigera* was recorded after the different time intervals of 2nd spray of different treatments are shown in the table-2. It could be seen from the results of 2nd spray; in the same way of the 1st spray, the synthetic pesticide radiant reduce *H. armigera* population progressively, as compared biopesticide. Radiant showed maximum reduction percentage after three and seven day after 2nd sprays as compared other treatments. The maximum reduction percentage was recorded in the plots treated with the radiant (54.42%) and (60.17%) after three and seven days after 2nd spray, followed by the plots treated with Neem seed kernel extract (32.27%) and (34.41%) and the minimum reduction percentage was recorded in the plots treated with synthic pesticides neem oil (31.42%) and (33.01%) after three and seven days after 2nd spray, respectively.

The mean reduction %age of *H. armigera* of different treatments of 2nd spray, showed the heighest mean reduction %age (57.30%) was recordrd the plots treated with radiant after different time intervals followed by the plots treated with Neem seed kernel extract (33.34%) and plots treated with Neem oil (32.27%) was recorded after 2nd spray on sunflower crop.

After 3rd spray the results showed that the reduction %age of *H. armigera* was recorded after the different time intervals of 3rd spray of different treatments are shown in the table-3. After the 3rd spray raidiant showed maximum reduction %age after three and seven days after sprays as compared other treatments. The maximum reduction percentage was recorded in the plots treated with radiant (60.27%) and (58.96%) after three and seven days after 3rd spray, followed by the plots treated with Neem seed kernel extract (40.11%) and (40.67%) and the minimum reduction percentage was recorded in the plots treated with neem oil (35.15) and (37.81%) after three and seven days after 3rd spray, respectively.

Table 3 Mean and reduction %age of different pesticides against *H. armigera* on sunflower crop before and after different time intervals of 3rd spray.

Treatments	Pre treatment Observation	3 Day After Spray	7 Day After Spray	Average
NSKE	1.57	57.73	60.44	59.09
Neem Oil	2.13	50.15	50.81	50.48
Radaint	1.57	70.97	74.88	72.93

The mean reduction %age of *H. armigera* of different treatments of 3rd spray, showed that the heighest mean reduction %age (65.11%) was recordrd the plots treated with Radiant after different time intervalls followed by the plots treated with Neem seed kernal extracts (40.39%) and plots treated with neem oil (36.48%) was recorded after 3rd spray on sunflower crop.

After 4th spray the results showed that the reduction %age of *H. armigera* was recorded after the different time intervals of 4th spray of different treatments are shown in the table-4. After the 4th spray the maximum reduction percentage was recorded in the plots treated with Neem seed kernal extracts (55.72%) and (29.40%) after three and seven days after 4th spray, followed by the plots treated with Neem oil (39.37%) and (23.44%) and the minimum reduction percentage was recorded in the plots treated with synthic pesticides Radaint (50.37%) and (28.53%) after three and seven days after 3rd spray, respectively.

Table 4 Mean and reduction %age of different pesticides against *H. armigera* on sunflower crop before and after different time intervals of 4th spray.

Treatments	Pre treatment Observation	3 Day After Spray	7 Day After Spray	Average
NSKE	0.99	63.21	54.80	59.01
Neem Oil	1.03	54.52	51.49	53.01
Radaint	1.40	79.11	71.66	75.39

The mean reduction %age of *H. armigera* of different treatments of 4th spray, showed that the heighest mean reduction %age (42.06%) was recordrd the plots treated with Neem seed kernal extracts after different time intervals followed by the plots treated with Neem oil (31.40%) and plots treated with Radaint (39.40%) was recorded after 4th spray on sunflower crop.

DISCUSSION

Natural products in insect pest management programs are gaining recognition in recent years due to environmental pollution, pest resistance and resurgence caused by indiscriminate use of synthetic chemical pesticides. The farmers cannot afford the cost of chemical pesticides and moreover chemical pesticides are not advisable for crops. Therefore, an attempt was made to find out ecofriendly pest management strategies by utilizing locally available plant materials. Among the NSKE was found to be most effective as compared to other Neem oil and tradinational synthetic pesticides like Radiant. The better results of NSKE may be due to antifeedant or repellent property and this is in line with the observation of Gilani (2001) who has reported that neem plant extracts deter insects from feeding. Redferen *et al.* (1980) also reported that neem compound *azadirachtinhas* antifeedant effect on insects. In addition to NSKE, also showed about 80% reduction in the mean number of *H. armigera*. This is in accordance with the findings of Zewain *et al.* (2005) they have reported that cis-dehydrocrotonin extracted from *Croton cajucar* bark inhibits the growth of *Heliothis virescens*.

The present results showed that Neem Seed Kernal Extracts reduce the maximum reduction percentage of *H. armigera* on sunflower followed by Neem oil and synthetic pesticides Radaint but their effect was non significant with Radaint. The results are partially in agreement with those of Thakur *et al.* (1988) also stated that the neem seed kernel extract can be used against *H. armigera* instead of highly toxic synthetic insecticides. Jaglan *et al*. (1997) proved that the neem seed kernel extract in chloroform: methanol (9:1) was the most promising in causing adverse effects on *H. armigera*. There are reports where NSKE and pure compounds obtained from NSKE had been found to produce diverse biological effects on insects: antifeedant (Pradhan *et al*., 1962), oviposition deterrent (Singh and Srivastava, 1983), etc. Of these antifeedant activity of neem was considered very important. Raghuraman *et al.* (2008) found Bollcure fraction (0.15%), Bollcure fraction (0.25%) and NSKE (az 1500 ppm) are relevant as most effective and economical treatments in reducing the larval population of *H. armigera* in chickpea. Our findings aer agreed with the findigs of Rao and Reddy (1990) they reported that effect of biopesticides at 10 days intervals and recorded the heighest yield.

Conculion

On the basis of results obtained from field trials among the pesticide/biopesticides applied, synthetic pesticides radiant significantly reduced the *H. armigera* population on sunflower field. Synthetic pestcides radiant proved to be most effective biopesticide against *H. armigera* to suppress the population as compared to rest of the treatments, after 1st, 2nd and 3rd spray. However Neem kernel extract was also found the most effective to suppress the population of *H. armigera* as compared other treatments in 4th spray on sun flower field.

Recommendation

Neem Seed Kernal extracts is safe and may be applied more prefareable against *H. armigera* on sunflower field, followed by Neem oil and synthetic pesticides Radiant.

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