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Research Article

EFFICACYOF BIOPESTICIDES AND SPINOSAD ON SPIDER'S FAUNAIN RICE

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Abstract

The study was conducted to evaluatedifferent bio-pesticides i.e.extracts of *Azadirachta indica, Eucalyptus globulus* and Spinosad on spider's population in rice fieldat Sialkot during kharif 2013. The data showed that significant differences ($P<0.05$)was recorded by *A. indica,E. globolus* extract and microbial pesticide application after 1, 3 and 7 daysresulting reduction in spider's population.The reduction in spider's population was significantly higher with pesticide treatment than control.After application, Spinosad caused higher reduction in spider's population than Eucalyptus and control.However significant difference ($P<0.05$) was recorded in botanical insecticides in reducing spider's population. After three days, all the chemical pesticides showed non significant effects ($P>6.05$) in reduction in spider's population than control. After seven days, Spinosad caused significantly higher reduction than botanical and control treatment.The result showed that maximum reduction in population of spider was recorded 33.23%, 28.01% and 25.06% with Spinosad, *A. indica* and *E. globolus* with 20% concentration respectively. However at the end it was concluded that spider's population was significantly resistant to *A. indica* and *E. globolus* based products than Spinosad.

Keywords: predator, resistant, bio-pesticides, microbial pesticide

Introduction

Rice is one of the most important food crops in the world. In Pakistan, rice is an importantfood and cash crop;staple food grain cropafter wheat and major source of foreign exchange earnings after cotton. It accounts for 3.1% of value added in Agriculture and 0.7% in GDP of Pakistan. Rice was cultivated on 2,789,000 hectares with a yield of 6,798,000 tones(Anonymous, 2013).However infestation of rice plant hoppers, stem borers and leaf folders, are always a serious challenge to rice production. In rice zonethe crop yield is seriously affected by pests ranging from 25-30% annually (Hashmi, 1994). Plant hoppers can cause leaves from orange to yellow then brown and dying, a condition called as hopper-burn. Plant hopper can also transmit ragged stunt and grassy stunt diseases. Crop loss may be up-to 100% in attack of hopper-burn; as in famous outbreaks of white backed plant hopper in Pakistan in 1978, Malaysia in 1979, and India in 1982; 1984 and 1985(IRRI).The major control was used in 1970s include resistant varieties, agricultural, biological, and chemical controls. The methods of chemically controllingrice insect pests including applying biological insecticides, such as *Bacillus thuringiensis* (Bt), Spinosad and Azadirachtin, and chemical insecticides.Natural enemies play an important role to prevent the insect pest outbreak in rice fields. Spiders are the most abundant rice predators represent more than 90% of natural enemies like brown plant hoppers living in paddy fields (Bambaradeniya and Edirisinghe, 2008; Lee et al.,1997).Natural enemies can be used to kill pests not only by direct attack but also by dislodging them from the plants and trapping them in the web (Landis et al.,2000).Huge quantity of chemical insecticides are applied in rice fields per year, which not only causes severe environmental pollution and the resurgence of herbivores but also reduces populations of natural enemies.The continuous use of a wide range of pesticides has caused many side effects, loss of biodiversity, problem of secondary pests, the resurgence of insect pests, insecticide resistance, residual toxicity and environmental pollution (Iqbal et al., 2007; Iqbal et al., 2009; Iqbal et al., 2011).The impact of synthetic pesticides on beneficial arthropods and the human health risks posed by exposure to these chemicals are issues of growing concern (National Research Council, 1996). This has prompted new compounds with reduced environmental persistence and low mammalian and avian toxicity but a fairly broad spectrum of insecticidal activity (Harris, 2000). Spinosad a mixtureof tetracyclic-macrolide compounds produced by actinomycete,saccharopolyspors spinosad, isolated from Jamaican soil samples(Sparks et al., 1998). Spinosad has been reported to be less toxic to natural enemies.Spinosad treated aphids were fed to coccinelid,recorded no predator mortality (Schoonover and Larson, 1995). Larvae of *Chrysoperla carnia* is exposed to Spinosad showed 19% mortalityafter 12 days (Cisneros et al.,2002). Synthetic pesticides like Triazophos (0.05%) and Quinalphos (0.05%) showed 64.78% 46.79% mortality in spider's population (Joseph et al., 2010). The bio-compound products were found to be quite safe to spider's population (Samiayyan and Chandrase kharana, 1998).Howeverthe study has been planned to compare the effects of different bio-pesticides and spinosad on spider's populationcompared to control treatment in Sialkot during kharif 2013.

Materials and Methods

The study was conducted to evaluate different bio-pesticides i.e. extracts of *Azadirachta indica, Eucalyptus globules* and Spinosad on spider's population in rice field at Sialkot during Kharif 2013. However the annual temperature during rice growing season was30°C and mean annual rainfallwasranges from 350-500mm. The soil is loamy with organic matter less than 1% and experiment was laid ina Randomized Complete BlockDesign with three replications. The plot size was 7.5× 22 sq.ft. A One month old seedling of nursery was transplanted in the fieldwith recommended spacing of 9 inches.The seeds of*Azadirachta indica* and *Eucalyptus goloboluswere* extracted by soaking them in boiled water for two hours. The soaked seedwere left for two days and then extracts were sieved through muslin cloth. These extracts were used as bio-pesticides and formulation of *Sacchalaropolyspora spinosa* (Spinosad)was used as microbial insecticide compared to insecticide application.The data was recorded before and after 1, 3 and 7 days afterspraying. The data wasrecorded by direct counting of 10 rice hills at random in the paddy field at five different positions.The data was analyzed by us JMP Pro 11 software using student's t test compared to contrast test for ANOVA and mean for comparison.

Results and Discussion

Table 1 showed that reduction in spider's population due to *A. indica* extract, *E. globolus* extract and microbial pesticideafter 1, 3 and 7 days of insecticide application.Thedata showed that significant differences(P<0.05) was recorded amongdifferent treatments resulting reduction in spider's population.

Table 1 showing reduction in spider's population by using different treatments

Treatments	Mean reduction (%) in spiders population		
	After 1 day	**After 3 days**	**After 7 days**
Spinosad	42.18 ± 3.43 a	37.92 ± 3.67 a	19.60 ± 2.76 a
Azadirachta indica	36.68 ± 4.49 ab	32.90 ± 3.85 a	14.44 ± 1.90 b
Eucalyptus globolus	33.38 ± 3.74 b	30.64 ± 3.72 a	11.18 ± 1.65b
Control	1.74 ± 0.29 c	1.49 ± 0.45 b	1.22 ± 0.37c
Significance (α=0.05)	<.0001*	<.0001*	<0.0001*
RSquare	0.98	0.97	0.97

The reduction in spider's population was significantly higher(P<0.05) with pesticide treatment than control. After application, Spinosad caused higherreduction in spider's population than Eucalyptus and control. Howeversignificant difference (P<0.05) was recorded in botanical insecticides in reducing spider's population. After three days, all the chemical pesticides showed non significant effects(P>6.05) higher reduction in spider's population than control.After seven daysSpinosad caused significantly higher reduction (P<0.05) than botanical and control treatment.

Direct and Indirect Impact

Fig. 1 and 2 showed that significant decrease in % reduction in spider's population was recorded with the passage of time by application of pesticideexcept control. There was no significant difference (P>0.05) between direct and indirect reduction in spider's population in control. There was a significant difference between direct and indirect reduction in spider's population using bio-pesticide application.This showed that bio-pesticides had higher direct control than indirectin reducing spider's population.

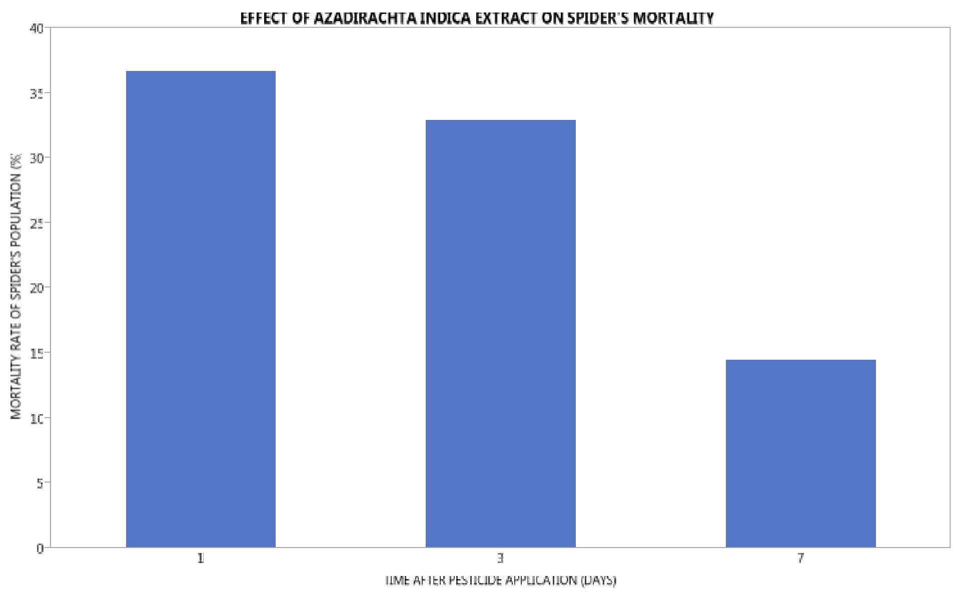

Fig. 1 showing effect of *Azadirachta indica* extract on Spider's mortality

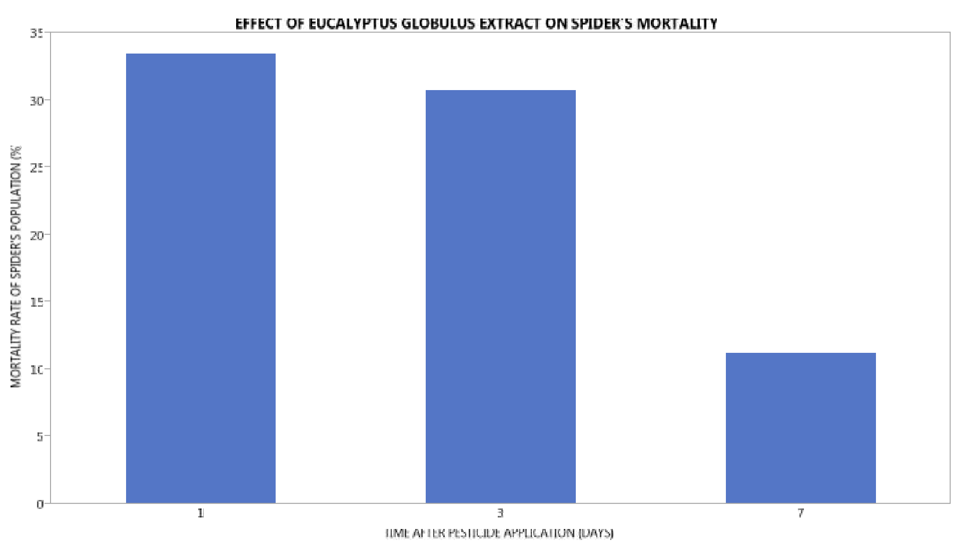

Fig. 2 showing effect of *Eucalyptus globules* extract on Spider's mortality

Bio-pesticides had least damaging to spiders population, however mortality of Spinosad treated plot wassignificantly highest followed by Neem and Eucalyptus. On the other hand Neem extracts caused relatively high mortality than eucalyptus in rice fields. This was in agreement with the observation made by Samiayyan and Chandrasekharan (1998); Sunder land, (1999); Richert, 1981; Richert 1984 and Trumbull, (1973). Maximum reduction of population was found after 1st day of spinosad application suggests that there was a direct effect of microbial pesticides on spiders population rather than indirect by eliminating host species.The result was compared to control which was evident that 33.23% reduction in spiders population recorded by using spinosad followed by 28.01%; 25.06% in Neem (20% conc.) and eucalyptus (20% conc.) respectively. However the population increased afterwards and analogous pattern of decreasing toxicity was recorded. The results of spinosad were in accordance with the findings ofSalgado, (1998) who reported that microbial pesticides showed 38.16% reduction in spider's population. Joseph et al., (2010) observed that 24.50% reduction in Azdirachtin at 0.04% concentration produced 24.50% mortality, which was significantly low than synthetic pesticides (Joseph et al.,2010).

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