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Management of *Spilosoma obliqua*Walker in BlackGram

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ABSTRACT

Black gram is an important pulse crop of Punjab state which is grown during summer and *kharif* seasons. Due to heavy losses in black gram yield by hairy caterpillar attack under Punjab conditions, on-farm trials on PAU recommended crop variety Mash 114 were conducted on 4haarea during *kharif* season of 2018 and 2019. The results revealed that T2-farmers' plots under recommended university practice and T3-KVK intervention with homemade natural insecticide gave similar yield of black gram as 9.30 and 9.29 q/ha, respectively which was higher than T1-control plots (7.26 q/ha). The benefit cost ratio of T2 (1.65:1) and T3 demonstration plots (1.66:1) was also higher than T1 plots (1.31:1). The yield increase of KVK demonstration plots over control plot was observed 27.96per cent. Thus, it can be concluded that black gram productivity could be enhanced by encouraging the farmers by using desi cow urine and ecofriendly insecticides which is ecologically sound and effective solution for hairy caterpillar management in comparison with chemical control.

Key Words: Bihar hairy caterpillar, Black gram, On-farm trials, Productivity, Yield.

INTRODUCTION

Pulses play an important role in Indian agriculture as rich source of plant protein and act as nutritive feed and fodder for livestock. These contribute 11per cent of the total intake of proteins in India (Reddy, 2010).Pulse crops also help to improve soil fertilityby maintaining nitrogen balance in the soil. Among various pulses, black gram, *Vigna mungo* (L.) is one of the most important crop which constitutes approximately protein (25-28%), ash (4.5-5.5%), oil (0.5-1.5%), fibre (3.5-4.5%) and carbohydrate (62-65%) on dry weight basis (Kaul, 1982). It is native to India which is popularly known as urd bean or mashkalai or marsh or mahn or black bean (Mandal, 2013).During 2017-18, black gram was cultivated over an area of 5.03mha (*kharif* + *rabi*) and recorded an average production of 3.28 mt at a productivity level of 652 kg/ha (Anon, 2019a).In Punjab State, black gram was grown on 1.6thousand ha area with production of 900 t and average grain yield of 5.80 q/ha during 2017-18 (Anon, 2019b).

Among major problems known to limit the yield of black gram, insects are the main constraint. In India, about 18 to 20 species of insect pests damage the black gram (Singh and Singh, 1977). On an average, 2.5 to 3.0 mt of pulses are lost annually due to pest problems(Rabindra *et al,* 2004). Under Punjab conditions, bihar hairy caterpillar (*Spilosomaobliqua* Walker) was recorded as major pest on blackgram in 2018 and 2019.Freshly hatched larvae of this pest feed gregariously mostly on under surface of leaves. The caterpillars eat green matter of leaves causing defoliation. The third and onward instar larvae cause serious damages and significant reduction in yield (Gupta and Bhattacharya, 2008).

To prevent crop damage due to pest attack, indiscriminate use of pesticides by the farmers leads to phytotoxicity and destruction of beneficial organisms. Use of eco friendly crop production and protection practices against this insect can be the best alternative to save our environment and to provide healthy food for mankind. Cow urine is used by the farmers as an effective indigenous

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method to control crop pests (Banjo *et al*, 2003) and spraying of the cow urine has been recommended to minimize the harmful effects of synthetic pesticides (Chauhan and Singhal, 2006). Plant materials with insecticidal properties have been used traditionally for generations throughout the world (Belmain *et al*, 2001). Both leaves and fruit of neem plant are known to have bitter taste having insecticidal, fungicidal and nematicidal properties (Schmutterer, 1995). Whole-plant extracts of *Datura stramonium* L. were defined as toxic for their insecticidal and antifeedant properties against *Spodoptera litura* Fabriciusand *Pericallia ricini* Fabricius (Lepidoptera: Noctuidae) (Prakash and Rao, 1997). Insecticidal activities of milkweedagainst *S. litura* were documented by Upadhyay (2013). Keeping this in view, the present study was undertaken to know the effectiveness of ecofriendly approaches in comparison with use of synthetic insecticides against management of bihar hairy caterpillar in black gram by conducting on-farm trials at farmers' field.

MATERIALS AND METHODS

The present study was conducted at 10 farmer's field, each farmer having 0.4 haarea during 2018-19 and 2019-20 in district Mohali of Punjab (Sub mountainous zone). For raising of black gram crop, need based input materials such as seed, rhizobium culture and quinalphos (insecticide) were provided to the farmers. The seed of black gram, Mash 114 was procured from Punjab Agricultural University (PAU), Ludhiana. The crop was sown during end of July month.The seed treatment was performed with rhizobium culture at the time of sowing which helps to enhance grain yield. The treatments included: T1: Farmers' Practice (Irrational use of insecticides), T2: Pulling out plants infested with young larvae, crushing grown-up caterpillars, spray Ekalux 25 EC (Quinalphos) @ 1250ml/ha (Recommended practice by PAU) and T3: 1stspray with desi cow urine @ 15 lt/ha, 2nd spray with neem, milkweed and dhatura leaves extract @ 15lt/ha (KVK Intervention). To prepare this extract, equal amount of neem, milkweed and dhatura leaves was put into water in a container. This container was placed in *Hara* (an earthen chamber for slow cooking on hot coals/dung cakes) for whole night. The extract was separated from the container in morning and used as insecticide for management of bihar hairy caterpillar in black gram.

The trials were conducted twice under field with three replications. Yield data were collected separately from all plots and based on the net plot yield, yield per hectare was calculated and expressed in quintal (q) per hectare. The data were statistically analyzed as per randomized block design (RBD) at 5% level of probability ($p \leq 0.05$) using least significant difference (LSD) test through SAS analysis (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Crop Yield

The data (Table 1) revealed that average yield in T2 and T3demonstration plots was almost similar as 9.30 and 9.29 q/ha, respectively)which was considerably higher than the average yield of T1 plots (7.26 q/ha). Earlier, similar pattern of higher yield in demonstration plots was observed by Veeramani *et al* (2017) during cluster frontline demonstrations on black gram at Vallore district of Tamil Nadu. In case of T2 and T3 demonstration plots, gross returns were Rs. 54080/ha and Rs. 54020/ha, respectively but due to more gross expenditure in T2 plots (Rs. 32800/ha), net returns and benefit cost ratio of T3 plots were little on higher side (Rs. 21520/ha and 1.66, respectively) than T2 plots. In T1 plots, gross returns were Rs. 42220/ha and net returns were Rs. 10020/ha with lowest benefit cost ratio, 1.31. The increase in yield was observed27.96 per cent in T3 plot over T1 plots.

Reasons of low crop yield in farmers' plots

Heavy losses in crop yield were observed due to hairy caterpillar attack during 2018-19 and 2019-20 under T1 plots. Due to favorable weather for insect development, following unrecommended practices by university for raising crop and

improper selection of crop variety and insecticides by the farmers, the crop got adversely affected in such plots. Therefore, low average yield was observed in control plots in comparison withT2 and T3 demonstration plots. Berani *et al* (2018) observed that heavy larval population of bihar hairy caterpillar (46.15 larva/plant)in black gram lowers the seed yield up to 4.97 q/ha in late sown crop at Anand Agricultural University, Anand, Gujarat during *kharif* season of 2016. Although weather conditions of district S.A.S. Nagar, Punjab in *kharif* season were different than Anand but attack of hairy caterpillar was observed in *kharif* season in both areas where proper guidelines of agricultural experts were not followed. In Punjab state another factor contributing in lowering the black gram yield was rainy season. It was observed that frequent rain in July and August months adversely effected crop yield even in timely sown plots.

Preference of biopesticides over synthetic chemicals

Although the yield in T2 and T3 plots is approximately similar but use of biopesticides have always edge over use of synthetic insecticides because they will build up healthy environment for our society.Wide use of insecticides is responsible for ozone depletion, environmental pollution, toxicity on non-target organisms, pest resistance, spread of pesticide residues and direct toxicity to users (Biondi *et al,* 2012). According to Damalas and Koutroubas (2018), use of biopesticides is a safer strategy than chemical pest control with potentially less risk to humans and the environment. Hence, by adopting ecofriendly crop protection practices, yield potential and economic returns from black gram cultivation can be raised for the farming community with an advantage of safe environment.

CONCLUSION

Results revealed that use of desi cow urine and handmade ecofriendly insecticide prepared from neem, milkweed and datura leaves provided effective management of bihar hairy caterpillar, whose results were almost equivalent to use of synthetic insecticiderecommended by PAU forachievingpotential yield of black gram.Farmers of different villages showed positive attitude for planning and execution of new technology.Use of biopesticides maycontribute towards effective insect management with potentially less risk to environmentand society than synthetic chemicals.

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Table 1. Yield performance and economics of mash crop (Average of two years)

Treatments	Yield (q/ha)	% increase of T2 over T1	% increase of T3 over T1	Gross expenditure (Rs.)	Gross return (Rs.)	Net return (Rs.)	B:C Ratio
T1	7.26±0.04	28.09	27.96	32200	42220	10020	1.31
T2	9.30±0.03			32800	54080	21280	1.65
T3	9.29±0.03			32500	54020	21520	1.66
LSD ($p \leq 0.05\%$)	0.09						

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