INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2001/03–4–501–502
http://www.ijab.org

Insecticidal Mortality and Pollination Role of Honeybee (*Apis mellifera* L.) on Cucumber (*Cucumis sativus* L.) Crop

ANJUM SUHAIL, ZAIN-UL-ABDIN, JAVAD IQBAL, M. IQBAL, UMAIR WESEEM, RAB NAWAZ SHAHID AND IKRAM-UL-HAQ
Department of Agriculture Entomology, University of Agriculture, Faisalabad–38040, Pakistan

ABSTRACT

Studies were carried out to investigate the insecticide mortality and pollination role of honeybees (*Apis mellifera* L.) in cucumber, *Cucumis sativus* L. Polo 500 EC and Endosulfan 35 EC were applied thrice @ 250 and 1000 mL ha^{-1}, respectively with seven days interval. Maximum mortality percentage of 34.64 and 66.64% was observed at 48 h after insecticide treatments of Polo 500 EC and Endosulfan 35 EC treatments, respectively. The foraging of honeybees resulted in maximum yield (352.7 kg ha^{-1}), 1000 grain weight (27.12 g) and germination (90.33%). Therefore, the use of honeybees increased the quality and quantity of cucumber seed crop significantly.

Key Words: *Apis mellifera* L.; *Cucumis sativus* L.; Pollination; Insecticidal mortality

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is a member of the Cucurbitacae, mainly cross-pollinated crops (Davis *et al*., 1970; Martin, 1970; McGregor, 1976) and insects especially honeybees play an important role in the pollination of these crops. The extent of pollination ranges from 60-80% depending upon the environment and visitation by insect pollinators (Boss *et al*., 1980). The use of honey bees (*Apis mellifera* L.) have been reported to improve fruit setting and seed yield (Cervancia & Forbes, 1993; Ambrose *et al*., 1995; Gingras *et al*., 1997). However, use of insecticides results in repellence or toxicity to bees, thus reducing the crop yield (Haq & Gardez, 1983; Illarionov, 1995).

This paper reports the role of honeybee in pollination of Cucumber crop and effects of some insecticides against this beneficial insect.

MATERIALS AND METHODS

Studies were conducted at the Postgraduate Agriculture Research Station, University of Agriculture, Faisalabad during 1999. The area was divided into three plots of 4.5 x 4.5 m for each of the three treatments *viz.,* with honeybees (T1), wind pollination (T2) and with honeybees + wind + all pollinators (T3) in RCBD. In treatments T1 and T2, iron stand cages (5 x 5 x 1 m) covered with muslin cloth, were placed at 10-15% blooming stage. T3 was kept open as control for pollination by all the pollinators and wind etc. Before providing small beehives, T1 and T2 were sprayed with Endosulfan 35 EC to kill all the insect pests e.g. hadda beetle (*Epilachna duodecastigma*) and red pumpkin beetle (*Raphidopalpa foveicollis*). In another experiment, under same planting geometry, two insecticides i.e., Polo 500 EC and Endosulfan 35 EC were sprayed thrice @ 250 and 1000 mL ha^{-1}, respectively. The honeybee mortality was observed after 24, 48, 72, 96, 120 and 144 h after insecticide application.

Seeds from ripe sun-dried cucumbers (*Cucumis sativus* L.) were taken out. Seed yields from each treatment were taken and converted into yield ha^{-1}. 1000 seed weight (g) was also calculated. Germination percentage was calculated after soaking 100 seeds $plot^{-1}$. These seed were soaked for 3-4 h treated with 6% sodium hypo chlorite solution to avoid fungal contamination and were placed in growth chamber at 25°C and 60% R.H. The data were tabulated and subjected to statistical analysis.

RESULTS AND DISCUSSION

In Table I it can be observed that mortality in honeybees increased to about 34 and 66% upto 48 h after treatment of Polo 500 EC and Endosulfan 35 EC; and per cent mortality decreased gradually to 13.32 and 29.32% upto 144 h, respectively. after Polo 500 EC and Endosulfan 35 EC. Whereas, least per cent mortality was observed in control treatment. It was observed by Anderson and Atkins (1968) that Endosulfan 35 EC was moderately toxic to honeybees which is in accordance to the results obtained during this study. However, some other researchers like Deshmukh (1991), Misra and Verma (1982), Kapil and Lamba (1974), Reddy (1997) and Singh *et al*. (1997) found it less toxic pesticide against these pollinators. While, Johansen (1977) reported minimal hazards of Endosulfan in

Table I. Insecticidal toxicity to honeybee (*Apis mellifera* L.)

Insecticides	Dose mL/ha	Percentage mortality after spray					
		24 h	48 h	72 h	96 h	120 h	144 h
Polo 500 EC	250	33.32	34.64	29.32	17.32	14.64	13.32
Endosulfan 35 EC	1000	58.64	66.64	54.64	40.00	33.32	29.32
Control	-	6.64	12.00	10.64	10.64	12.00	8.00

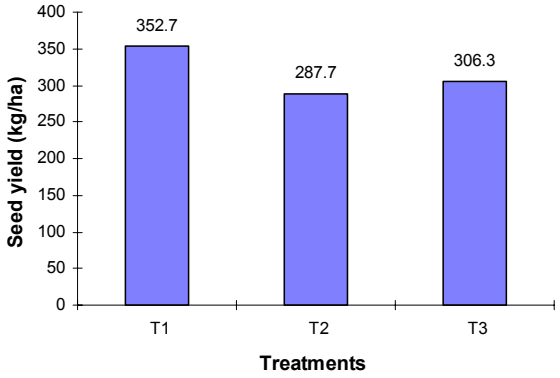
Means within a column not sharing a letter in common differ significantly (P=0.05, DMRT)

honeybees when applied during late evening or night time under field conditions.

Fig. 1 shows that honeybees enhanced the seed yield about 18.43% as compared to wind-pollinated plot; whereas, 13% increase was observed in comparison to open plot where all the pollinators participated. These results are in conformity to those of Gingras *et al*. (1997) and Stanghellini *et al*. (1997) who observed an increase in seed yield associated with more fruit set and superior weight of cucumber by the use of *Apis mellifera*.

Fig. 2 shows that the germination percentage was higher (90.33%) in T1 as compared to T2 and T3 where 69 and 80.33% values were calculated. It is clear from Fig. 3 that the 1000 seed weight was also maximum in T1, which

Fig. 1. Seed yield (kg ha^{-1}) potential of cucumber under different pollinating agents



was 37.5 and 21.75% more than that of T2 and T3. These results also agree to the finding of Davis *et al*. (1970), Martin (1970) and McGregor (1976) who also suggested the use of insect pollination.

It can be concluded that the use of honeybees (*Apis mellifera* L.) with safer insecticides will enhance the crop yield

Fig. 2. Germination (%) comparison of cucumber under different pollinating agents

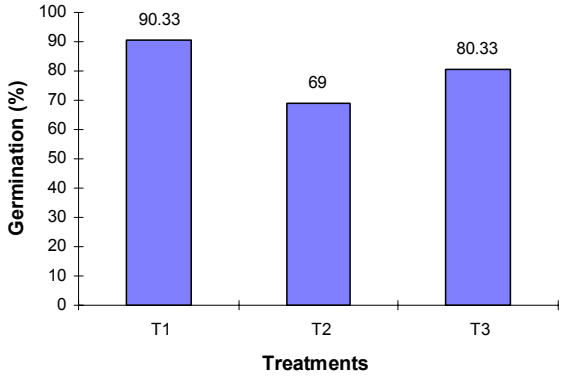
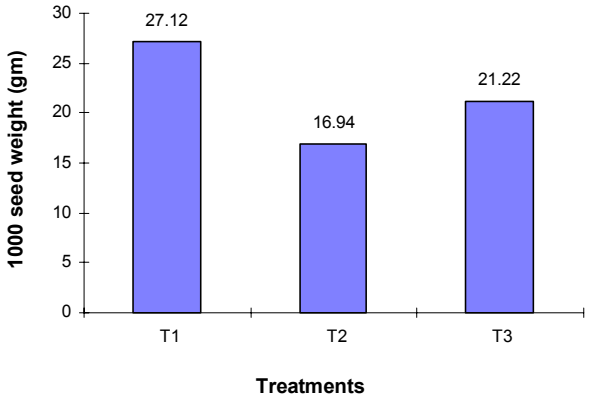


Fig. 3. 1000 seed weight (g) comparison of cucumber under different pollinating agents



REFERENCES

Ambrose, J.T., J.R. Schultheis, S.B. Bambara and W. Mangum, 1995. An evaluation of selected commercial bee attractants in the pollination of cucumbers and watermelons. *American Bee. J.,* 135: 267–72.

Anderson, L.D. and E.L. Jr. Atkins, 1968. Pesticide usage in relation to beekeeping. *Ann. Rev. Entomol.,* 13: 213–38.

Boss, T. K., M.S. Som and J. Kabir, 1980. *Vegetable Crops,* p. 61. Naya Prokash, Calcutta.

Cervancia, C.R. and M.F. Forbes, 1993. Density of bees (*Apis mellifera* L.) needed for effective pollination of cucumber (*Cucumis sativus* L.). *Philippines J. Sci.,* 122: 129–31.

Davis, L.B., M.L. Laster and G.M. Campbell, 1978. Study shows new bees better for cucumber fields. *Miss. Farm Res.*, 33: 1–2.

Deshmukh, P.B., 1991. Toxicity of some insecticides to Indian honeybee *Apis cerana* F. *Pestology,* 15: 31–3.

Gingras, D., J. Gingras, D. de. Oliveria and K.W. Richards, 1997. Honeybees and the production of cucumbers in Quebec (Canada). *Proc. 7th Int. Symp. Poll. Lethbridge,* pp: 395–9. June 23–28, 1997. Albama, Canada.

Haq, M. and T. H. Gardezi, 1983. A comparative study on the toxicity of organophosphorus insecticides to honeybees. *Pakistan Entomol.,* 5: 83–7.

Illarionov, A.I., 1995. Ecological mechanism of the connection between honeybee and insecticide treated plants. *Agrokimiya,*(6: 89–96.

Johansen, C.A., 1977. Pesticides and pollinators. *Ann. Rev. Entomol.,* 22: 177–92.

Kapil, R.P. and D.P.S. Lamba, 1974. Toxicity of some important insecticides to *Apis cerana* Fab. *Indian J. Ent.,* 36: 6–10.

Martin, E.C., 1970. The use of honeybees in the production of hybrid cucumbers for mechanical harvest. In the Indispensable Pollinators, *Ark. Agri. Ext. Serv. Misc. Pub.,* 127: 106–09.

McGregor, S.E., 1976. *Insect Pollination of Cultivated Crop Plants,* p. 411. U.S.D.A. Agri. Handbook No. 496.

Misra, R.C. and A.K. Verma, 1982. Relative toxicity of some insecticides to *Apis cerana* F. *Indian Bee J.*, 44: 69–71.

Reddy, M.L.K., 1997. Relative toxicity of some insecticides to honeybees (*Apis cerana indica* Fab.). *J. Res. ANGRAU.*, 25: 26–8.

Singh, P.B., D.S. Singh, M. Naim and V.S. Srivastava, 1997. Contact toxicity of some insecticides to oriental honeybee, *Apis cerana indica* foragers. *Ann. Plant Prot. Sci.,* 5: 207–9.

(Received 11 July 2001; Accepted 08 September 2001)