EFFECT OF BEE AND HAND POLLINATION ON THE FRUIT AND SEED SETTING AND QUALITY OF CUCUMBER (*Cucumis sativus* L.)

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The attempt of modern agriculture has lead to increased productivity per unit area. To achieve this goal, several intensive studies were carried out on plant breeding, physiology, soil and water relationship and several other disciplines. However, one of the main requirements to increase crop and seed yield and quality which is "pollination" has not been fully looked into.

Pollination which is a vital component in seed production in many horticultural crops, is the process of transferring matured pollen grains from anthers to stigma. It precedes fertilization of the ovaries which are then capable of developing into matured high quality seeds. In hybrid seed production pollination is the most important than all.

Plant breeders frequently use bees when producing seeds in confined areas. In United States of America, honey bees are used in the production of 90% of the cucumber and musk melon seeds (Martin,1967). Later the need of bees for the production of quality fruits in field grown cucumber was also recognized. Oldrich (1974) reported that 50 crops including cucumber were dependent upon bees to produce larger yields. Steinhaus (1971) showed that the grade 2 cucumber fruits which result from inadequate pollination can be considerably reduced by increasing the bee colonies per acre.

Several scientists have shown that the fruit size and seed per fruit in cucumber increased when bees visited the flowers several times which resulted in high intensity of pollination (Ruffner and Hall, 1963; Martin, 1967; Connor and Martin, 1969).

Among all pollination methods, artificial pollination is the best to obtain high quality fruits due to various reasons. Environmental factors can restrict the activities of the pollinating animals in natural pollination,

but artificial pollination can be done avoiding the environmental problems. However, artificial method is very expensive due to heavy use of man power and is laborious (Wilson and Coccison, 1988).

EXPERIMENT

This experiment was carried out in a green house at the Department of Horticulture, University of Los Banos, Philippines from September 26 to December 26, 1989. A slicing variety of cucumber CV "Phil Maria" was used in this experiment. Seeds were planted on raised beds at the spacing of 2m x 2m and all the recommended cultural practices were followed.

The treatments were arranged in Randomized Complete Block Design with three replicates in each. Each replicate had five plants in a row.

All the experimental plots were caged by nylon nets, when the staminate flowers first appeared. This helped to prevent the pest damage and pollination by other insects.

Honey bees (*Apis millifera*) were introduced one week after caging. One nucleus colony with more than 2,500 bees was placed in the middle of the plot.

The pistillate flowers were tagged and covered. For hand pollination, mature pollens collected from several anthers were placed on the lobes of stigma and covered with petals to prevent from falling. Hand pollination was done from 6.00 a.m. to 9.00 a.m.

The flowers bloomed in October and November and the fruits were harvested in December.

All the seeds from the sampled fruits were extracted and washed to remove the mucilagious layer. Seeds were then air dried to reduce the moisture content up to 10%. Filled seeds and unfilled seeds were separated by visual observations. The seeds were weighed and then samples of 100 seeds wrapped in moist papers were placed in a germinating cabinet.

Number of fruits set, fruit length, diameter and weight, filled and unfilled seeds per fruit, 1000 seed weight and germination percentage were used to evaluate the efficiency of pollination methods. Means were computed using ANOVA.

RESULTS AND DISCUSSION

The effects of the two pollination methods tested on fruit set and quality (size and weight) are given in Tables 1 and 2 respectively.

There was no statistically significant difference on the fruit set and production of cucumber. However, the slight difference observed in the values could be due to the unfavourable factors such as high temperature that could have affected the activities of bees within the netting cages.

The pollination methods tested did not show any significant effects on fruit quality. However, the higher values for bee pollinated fruits could be due to the high intensity of bee pollination. Bees could have visited flowers several times

Table 1 : Effect of bee and hand pollination on fruit set and production of cucumber

Pollination Method	% fruit set of the total female flowers	% fruit havrvested of the total fruits set
Bee Pollination	53.3 a*	65.4 a*
Hand Pollination	63.3 a	75.1 a

* according to DMRT

Table 2 : Effect of bee and hand pollination on the fruit quality of cucumber

Pollination Method	Fruit length (mm)	Fruit diameter (mm)	Fruit weight (g)
Bee pollination	142.0 a*	38.4 a	138.8 a
Hand pollination	129.9 a	35.3 a	136.7 a

* according to DMRT

but hand pollination was done only once. This is an obvious advantage in bee pollination.

The effects of the pollination methods tested on seed set and quality are presented in Table 3.

The seed set and quality in bee pollinated plants did not significantly vary from those produced by hand pollinated plants. However, the lower number of unfilled seeds and higher seed weight are good signs of the positive effects of bee pollination. This finding could be interesting for those involved in the production of quality seeds.

CONCLUSION

Bee pollination is more practical, economical and less laborious compared to hand pollination in cross pollinated crops. Further, the honey obtained from bees can provide additional income. This would be recommended specially for larger seed production concerns. Availability of supplementary food for the bees, biological and environmental conditions and spraying of pesticides are the critical factors which could affect the activities of bees.

Table 3 : Effects of bee and hand pollination on seed set and quality of cucumber

Pollination Method	Average No.of filled seeds per fruit	Average No. of unfilled seeds per fruit	Average 1000 seed weight (g)	Average germination percentage
Bee pollination	63.9 a*	29 a	19.7 a	87.3 a
Hand pollination	64.2 a	37.3 a	16.7 a	87.9 a

* according to DMRT

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