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THE IMPORTANCE OF CERTAIN INSECTS AS POLLINATORS OF SUNFLOWER (*HELIANTHUS ANNUUS* L.)

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ABSTRACT

The population of our country is now rising fast, brightening the grip of hunger on the throat of humanity. One of the greatest problems of India is to provide food for over increasing population. This food problem can not be solved by cereals alone. We have to face the situation by adding vegetables also in sufficient quantity with our food. The Fruits are an indispensable items of human diet as they possess some of the essential nutrients which can not be compensated by other food materials. The vegetables supply important minerals, vitamins and roughage. They promote digestion and improve our health. The acid produced during digestion of meal is neutralized by vegetables. Some of the vegetables are of great medicinal importance. Mostly, the vegetables are eaten in cooked form but some are taken in raw condition. The fruits, flowers, roots, leaves and even plants as a whole of vegetables are used in one or other forms.

KEYWORDS: *Insects, Pollinators and Sunflower.*

INTRODUCTION

Sunflower is a recent introduction in our India for the production of oilseeds. Cultivation of sunflower as an oilseed crop is becoming more and more important and vast areas of land are being used for its cultivation. Poor seed-setting is a very serious problem of the sunflower crop. To this phenomenon, a number of causes are attributed; one of the major causes among them is the absence of pollinators. Effective and efficient pollination of the flowers in any crop determine seed-setting and the ultimate yields. This is especially true in the case of cross pollinated crops such as sunflower.

Importance of native insect pollinators can be said to be a new entomological approach. Wild bee management has been used for alfalfa seed, red clover seed and apples in foreign countries. Sunflower is a potential crop for the purposeful use of native insect pollinators. Native insect pollinators usually forage within or around the field where they nest. They do not visit as wide a spectrum of flowers as the honey bees.

The absence of insect pollinators, particularly honeybees *(Apis melli/era* L.), adversely affects seed set and yield in commercial sunflower (Langridge & Goodman, 1974; Diez, 1979; Krause & Wilson, 1981; Freud & Furgala, 1982). Preliminary studies on sunflower (Birch, Van der Sandt, Herrmann & Johannsmeier, 1985) indicate the same effects in South Africa. Hurd, La Berge & Linsley (1980) also emphasized that honeybees are the most important pollinators of commercial sunflower. However, the role of insects there than honeybees should not be ignored. Accounts of the abundance and activity of insects are given by Fargala (1954); Amason (1966); Langridge & Goodmani (1974); Palmer-Jones &

Forster (1975); Radford, Nielson & Rhodes (1979) and Parker (1981). Similar information for South Africa has also been reported (Du Toit, 1988).

The aim of this study was to investigate and compare the effects of pollination efficiency of spotted maize beetles and house flies on the seed set of sunflower. Seed set obtained by means of these insects when caged with sunflowers was compared with the seed set of plants in cages without insect pollinators as well as with open uncaged plants freely exposed to all pollinators in a field situation.

MATERIAL AND METHODS:

Study Area: Sidhi is the Distt. head quarter of old Vindhya Pradesh. Presently it is one of the very important Distt. of Madhya Pradesh. Sidhi is situated on the North-East border of the state. The geographical location is $23^0$15'N - $24^0$15'N latitude and longitude $81^0$45'E- $82^0$45'E. The town is located on a plateau and is situated 65.7 meters above the mean sea level. The Son, Gopad, Banas and Mahan rivers surround the town from almost three sites and mark its Northern, Southern and Western boundaries. Hills mark the Eastern boundary. Sidhi is covered by different ranges of Vindhya series. The whole area is formed by an undulated plateau, encircled by Panna range (a part of Upper Vindhyan) towards North-West and the Kymore range towards the northern side running across South-West and North-east direction. In fact, the Vindhyan has two distinct groups of rock deposits, viz., the upper Vindhyan System and the Lower Vindhyan System of rocks.

Insect-proof cages were erected prior' to bloom at random in the field, each cage covering a similar number of plants of similar size and stage of development. The cages were made from slotted angle iron, measured 4.4 m long × 3.0 m wide × 2.2 m high and were covered with lightweight white nylon netting having a very low shading value of 20%. The small mesh size of the netting only permitted entrance of insects with a diameter less than 1 mm. Each cage covered three rows of sunflowers, with 10-15 plants per row. The plots were trimmed at both ends of each row to avoid the sunflower heads touching the netting. All insects were removed by hand before the treatments commenced.

RESULT AND DISCUSSION:

The percentage of under-developed seeds (papery pips) was significantly higher with house flies (35%), American bollworm larvae (52%) and no insect pollinators (43%) than with honeybees (24%), spotted maize beetles (24%) and open control treatments (23%). Herring (1981) reported that the sterile head centre of sunflowers is normally overlooked when seed set is determined. According to Khanna (1972), the number of under-developed seeds is mainly affected by competition for water and nutrients, as a physiological nutrient scarcity develops when good set is achieved.

Abortion of the central florets is a general phenomenon in sunflowers and results in poor or no seed set of the central florets (Khadiikar & Mahajan, 1974), although it could also be induced or increased by drought or a boron deficiency. The yield of sunflower seed in the un caged control plots was 47% higher than that from cages without insect pollinators. Cages containing honeybees or spotted maize beetles produced yield increases of 52% and 77% respectively, when compared with cages without insect pollinators. Sunflowers in cages with house flies yielded a 7% increase, while a 5% decrease was obtained in cages with American bollworm larvae. The calculated 1 000 filled-seed mass indicated that the commercial sunflower compensates for fewer filled seeds when seed set is poor, by producing heavier seeds. However, this response is not sufficient to compensate for the poor seed set as reflected by the eventual yield. This agrees with the results of Freud & Furgala (1982).

Although the best seed set and yield were obtained from sunflowers caged with spotted maize beetles, the usefulness of these beetles is restricted by biological factors (Du Toit, 1988). The 150 beetles per cage was also much higher than the naturally occurring mean of 10 beetles per 100 heads observed in the western Transvaal. A high number of beetles was used in the caged trials to mimic the high number of beetles per single head some- times found in the field. Spotted maize beetles aid pollination during certain times and in localized areas, but in large commercial sunflower fields these beetles would have less effect because of their sporadic occurrence.

The results indicated that American bollworm larvae do not play a role in sunflower pollination, although they were frequently encountered in the field. This is mainly because of their passive behaviour. American bollworm larvae eat the floral parts and sometimes adversely affect seed set. The damage done by these larvae is usually unimportant in commercial plantings because the larvae are distributed between many plants. A decrease in seed set in sunflowers without pollinating insects has been recorded by various researchers (Langridge & Goodman, 1974; Furgala, Noetzel & Robinson, 1978; Freud & Furgala, 1982; Birch *et al.,* 1985), and the results of the present study support these findings. From the above results, it must be concluded that honeybees are extremely efficient pollinators of commercial sunflower in South Africa. At times, other insects, like the spotted maize beetle, may also contribute to the pollination of this crop.

CONCLUSION:

It is concluded that house flies do not play a role in sunflower pollination. Field observations have indicate that house flies do not move as actively as honeybees on or between the heads of sunflowers. This may result in the slow movement of pollen between florets and between heads. The poor seed set recorded from sunflowers caged with house flies (38%) could not be attributed to an insufficient number of flies, as more than 25 flies per cage were still alive when the bloom period had ended. The fifty house flies initially placed in the cages were far more than the highest average of 2, 24 flies per hundred heads recorded at Pretoria.

REFERENCES :

- ARNASON, A.P. (1966). Recent studies in Canada of crop pollination by insects. *Bee WId.* 47 *Suppl. 107-124.*
- BIRCH, E.B., VAN DER SANDT, J.C., HERRMANN, J.M. & JOHANNSMEIER, M.F. (1985). Bee pollination of sunflower. *Proc. 11th Int. Sunfl. Con/., Mar del Plata, Argentina* 1, 255-260.
- DIEZ, S.L. (1979). Comparative trials of pollination of sunflower *(Helianthus annuus)* by honeybees *(Apis mellifera)* - in individually isolated flower heads and in caged plots. *Proc. 27th Int. Congr. Apic., Athens, Greece,* 407-411.
- DU TOIT, A.P. (1988). The pollination ecology of commercial sunflower *(Helianthus annuus* L.) in South Africa with special reference to the honeybee *(Apis mellifera* L.). Unpublished M.Sc. thesis, University of Pretoria, 143 pp.
- FREUD, D.E. & FURGALA, B. (1982). Effect of pollination by insects on the seed set and yield of ten oilseed sunflower cultivars. *Am. Bee 1.* 122, 648-652.
- FURGALA, B. (1954). Honeybees increase seed yields of cultivated sunflowers. *Glean. Bee Cult.* 82, 532-534.
- FURGALA, B., NOETZEL, D.M. & ROBINSON, R.G. (1978). Observations on the pollination of hybrid sunflowers. *Proc. 4th Int. Symp. Poll., Maryland, USA. 45-48.*
- HERRING, M.F. (1981). Factors affecting seed set in sunflowers. *Oi/seeds News Sept.* 16-17,20-21.
- HURD, P.D., LA BERGE, W.E. & LINSLEY, E.G. (1980). Principal sunflower bees of North America with emphasis on the south-western United States *(Hymenoptera: Apoidea). Smith. Contr. Zool.* 310, 158 pp.
- KHADIIKAR, B.T. & MAHAJAN, A.G. (1974). The problem of seed filling and setting in sunflower *(Helianthus annuus* L.). *Pakist. K. V. Res.* 1. 118-120.
- KHANNA, K.R. (1972). Factors affecting the production of filled seeds in sunflower. *Euphytica* 21, 384-387.
- KRAUSE, G.L. & WILSON, W.T. (1981). Honeybee pollination and visitation patterns on hybrid oilseed sunflowers in central Wyoming *(Hymenoptera: Apoidea). 1. Kansas Ent. Soc.* 54, 75-82.
- LANGRIDGE, D.F. & GOODMAN, R.D. (1974). A study on pollination of sunflowers *(Helianthus annuus). Austr. 1. Exp. Agric. Anim. Hush.* 14, 201-204.

- PALMER-JONES, T. & FORSTER, I.W. (1975). Observations on the pollination of sunflowers. *N.Z.* J. *Exp. Agric.* 3, 95-97.
- PARKER, F.D. (1981). Sunflower pollination: abundance, diversity and seasonality of bees and their effect on seed yields. *1. Apic. Res.* 20, 49-61.
- RADFORD, B.J., NIELSON, R.G.H. & RHODES, J.W. (1979). Agents of pollination in sunflower crops on the central Darling Downs, Queensland. *Austr.* J. *Exp. Agric. Anim. Hush.* 19, 565-569.