

EFFECT OF DIFFERENT MODE OF POLLINATION ON QUANTITATIVE AND QUALITATIVE TRAITS OF NIGER (*GUIZOTIA ABYSSINICA* CASS)

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ABSTRACT

Increasing seed yield in niger (*Guizotia abyssinica*) is one of the most important agronomic trait which is yet to be explored maximally. The proper pollination is the basic requirement for seed setting and finally to seed yield. In present study, we report the effect of different modes of pollination on the final yield on niger. The niger crops were subjected to three different modes of pollination viz. caged without insect pollinators, caged with *Apis mellifera* and open to all insect pollinators. We observed that the best mode of pollination is when crop is caged with *Apis mellifera* which resulted into highest percent of seed set, number of filled seed/capitulum, 1000 seed weight and oil content per cent etc. as compared to crop caged without insect pollinators

INTRODUCTION

Niger (*Guizotia abyssinica*) is one of the indigenous oilseed crops. It is commonly known as Ramtil/ Sarguja/ Kalatil. Though, Niger is found to be self pollinated but they are largely self incompatible. Therefore this crop perpetuates largely through cross pollination ranging from 0 to 100 percent depending on the genotype and other environmental factors (Subhas, 2005). Bees are considered to be the most important pollinators because they are the only insect whose immature stages are reared exclusively on pollen and nectar while they visit flowers for pollen/nectar harvesting (Crane 1990; Haftom *et al.*, 2014). Like other crops, niger improvement does include its yield enhancement and sufficient pollination is the first step towards attaining good yield. Since niger is largely a cross pollinated crop the mode of pollination will certainly play important role in higher seed yield. Patel (1988) reported in niger crop that open pollination (OP) and Bee pollination (BP) increased the number of filled seeds, yield and also oil content percent. Thus exploitation of bees for pollination is one of the best strategies for enhancing the crop production. In present study we studied the effect of different modes of honeybee pollination and observed different yield parameters.

MATERIALS AND METHODS

The study was conducted by growing niger during the 2014 and 2015 cropping seasons at Krishi Vigyan Kendra, Kaimur (Bihar) following standard agronomic condition under AICRP on niger programme. The farm is located at an elevation of 2000 ft. and at 83°84' latitude and 25-26° longitude. The

study was conducted in a randomized block design (RBD) with three treatments and eight replications in an experimental plot size of 3x2 m². The treatments under study were T1: crops caged without insect pollinators; T2: crops caged with honeybee and T3: crops opened to all insect pollinators. The caged were put immediately before the beginning of blossom, and colony transferring was done at 5 to 10% flowering stage of the plant. The cage of fine white nylon mosquito net of 25 mesh/cm² and 3x2x1.5 m³ was used in the experimental plots. The observations were recorded in respect to yield and yield contributing factors such as flowering period, seed setting percentage, number of filled seeds per capitulum, thousand seed weight with qualitative attributes such as germination and oil content percent.

RESULTS AND DISCUSSION

To determine the effect of pollination efficiency of honeybee in niger in comparison to other modes of pollination viz., open to all insect pollinators and crop caged without insect pollinators in respect of flowering period, seed setting percentage, number of filled seeds per capitulum and 1000 seeds weight were depicted in Table 1.

Crop caged without insect pollinators has the longest flowering period (29.2 days), whereas open pollinated crops has the smallest flowering period (21.4 days). Haftom *et al.* (2014) also observed similar trend of observation as far as flowering period is concerned.

It is apparent that the treatments differed significantly from

Table 1: Effect of honey bee pollination on yield contributing factors

Treatment	Flowering period (days)	Seed setting (%)	No. of filled seeds/capitulum	1000 seed wt.(gm)
T1: Crops caged without insect pollinators (control)	29.2	18.20	15.10	3.20
T2: Crops caged with honey bee	24.8	78.60	40.50	3.42
T3: Crops open to all insect pollinators	21.4	65.40	35.72	3.58
S.Em (\pm)	0.852	1.76	0.48	0.02
CD(p = 0.05)	2.012	5.44	1.49	0.09

Table 2: Effect of honey bee pollination on yield with Qualitative Attributes

Treatment	Yield (Qt./ha)	Germination(%)	Oil content (%)
T1: Crops caged without insect pollinators	1.30	28.40	24.26
T2: Crops caged with honey bee	5.60	79.00	30.80
T3: Crops open to all insect pollinators	4.82	84.50	32.68
S.Em (\pm)	0.18	0.84	0.74
CD(p = 0.05)	0.40	2.88	2.31

each other in respect to seed setting percent. The seed setting was maximum (78.60%) in case of crop caged with honeybee followed by crops open to all insect pollinators (65.40%), while the lowest (18.20%) seed setting was recorded in crops caged without insect pollinators. In sunflower, crops caged with honeybees increased significantly the percentage of seed setting compared with crop caged without honeybees (Oz *et al.* 2009).

Significant variation was observed in number of seeds/capitulum among the treatments. Plot caged with honeybees has the highest number of seeds/capitulum (40.50) followed by crops open to all insect pollinators (35.72) while the plants caged without insects had the least number of seeds/capitulum (15.10). The observation of Sattigi *et al.* (2004) corroborated our results who also found the highest (33.0) and least number of seeds/capitulum (17.8) in crops caged with bees and without honeybees respectively.

Observations on the effect of pollination on 1000 seed weight revealed that the niger grown under open to all insect pollinators showed highest test weight (3.58g), followed by caged with honeybees (3.42g) whereas the lowest 1000 seed weight was recorded in crops caged without insect pollinators (3.20g). Similar observation was reported by Panda *et al.* (1996) that the seeds obtained from sunflower grown under open pollination gave the highest seed weight (70.8g/1000 seeds) followed by crop subjected to bee pollination (60.8g) and without insect pollination (34g).

Mode of pollination also had a significant effect on yield (qt./ha). The highest yield was obtained from crops caged with honeybees (5.60 qt./ha) followed by crops open to all insect pollinators (4.82 qt./ha) whereas crops excluded from insects had the lowest yield (1.30 qt./ha). Rao and Surya narayana (1990) reported on niger that in open pollinated plots, seed setting was 73 percent but in plot caged to exclude insects was 3 percent and seed yield by weight was 4 times higher.

Our study also showed the highest oil content percent in niger seed under crops open to all insect pollinators (32.68%), followed by crops caged with honeybees (30.80%), whereas lowest oil content was obtained in crops caged without insect

pollinators (24.26%). Panda *et al.* (1996) found similar trend of results wherein the highest oil content (38.42%) in open pollinated as compare to bee pollinated (36.67%) and without insect pollinated crop (32.57%) were observed. Different modes of pollination in niger had marked effect on germination percent also. Highest germination percentage was observed in crop open to all insect pollinators (84.50%) followed by crops caged with honeybees (79.0%), whereas lowest germination percent was found in crops caged without insect pollinators (28.40%) Kakar (1980) found similar trend in the germination of cauliflower seeds. He found maximum germination percent (96.55%) in open pollinated plots, followed by bee pollinated plot (92.50%), whereas, least in plot without bee (20%).

REFERENCES

- Crane, E. 1990.** Bees and Beekeeping Bath Press Ltd. Avon. pp. 68-69.
- Kakar, K. L. 1980.** Prospects of bees as pollinating agent of cauliflower. Proc. 2nd Int. Conf. Apic. Trop. Climate; New Delhi. pp. 545-556.
- Haftom, G. and Alemayahu, T. T. 2014.** Flight intensity of honeybees (*Apis mellifera*) and its relationship with temperature, Sunshine, coloudiness and relative humidity. *Livest. Res. Rural Dev.* **26**: 01.
- Oz, M., Karasu, A., Cakmak, I., Goksoy, A. T., Turan, Z. M. 2009.** Effect of honeybee (*Apis mellifera*) pollination on seed set in hybrid sunflower (*Helianthus annuus* L.) *Afr. J. Biotechnol.* **8**(6): 1037-1043
- Panda, P., Satapathy, C. R., Padhi, J. and Sagar, S. Singh. 1996.** Effect of *Apis mellifera* pollination on yield of sunflower. *Indian J. Ent.* **58**(2): 161-164.
- Patel, L. 1988.** Effect of honeybee *A.C. indica* pollination on yield of niger and its oil content. *M.Sc.(Ag.) Thesis submitted to OUAT, Bhubneshwar, Orissa.*
- Rao, G. M. and Surya narayana, M. C. 1990.** Studies on the foraging behavior of honeybees and its effect on the seed yield in niger. *Indian Bee. J.* **52**(1): 31&33.
- Sattigi, H. N., Kabrekar, D. N., Gundannavar, K. P., Kulkarni, K. A. 2004.** Effect of bee pollination on the yield parameters of Niger in karnataka. *I. Agric. Sci.* **17**(4): 831-832.
- Subhas, H. 2005.** Studies on Self fertility and autogamy in niger (*Guizotia abyssinica* cass.) M.Sc. Thesis. *Dharwad University of Agricultural Sciences.*