

HONEYBEE – A NATURAL POLLINATOR IN INCREASING THE SEED YIELD AND INCOME IN THE NIGER (*GUIZOTIA ABYSSINICA* CASS) A TRADITIONAL TRIBAL CROP OF SOUTH GUJARAT REGION

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Abstract: Niger (*Guizotia abyssinica* Cass) is one of the important minor oilseed crop of hilly regions and it is used for oil purpose only by the tribal people. Therefore a study was planned to document about the role of honeybees as a pollinator in increasing the seed yield in Niger crop with paired plot technique at the Niger Research Station (NRS) at Navsari Agricultural University (NAU) and at farmer's field, Vanarasi, Navsari, Gujarat and also studied its cost benefit ratio (CB) of Niger cultivar. The trial was conducted at Niger Research Station (NRS), Vanarasi in 2014-15 and at farmer's field to ascertain the involvement of honey bees (*Aphis mellifera*) in escalating the seed yield of Niger crop (Due to pollination) and its effect on income due to increase in the Niger seed yield. Significant differences were observed for number of capitula/plant, number of seeds/capitula, 1000 seed weight and seed yield in both the location. However, the seed yield and gross returns were considerably higher in first location of T1 Natural plot/ open pollinated with Bee hive (*Aphis mellifera*). The maximum seed yield of 275 Kg/ha with the gross return of Rs. 16,500/- was obtained in this treatment.

Keywords: Niger, Honeybee, *Aphis mellifera*, Pollination

INTRODUCTION

Niger (*Guizotia abyssinica* Cass) is a tribal crop and is one of the most important minor oilseed crops of India. Niger having many names but the most commonly as *ramtil*, *jagni* or *jatangi* (Hindi), *ramtal* (Gujarati), *karale* or *khurasani* (Marathi), *uhechellu* (Kannada), *payellu* (Tamil), *verrinuvvulu* (Telugu), *alashi* (Oriya), *sarguza* (Bengali), *ramtil* (Punjab) and *sorguja* (Assamese) in various parts of the country (Rao and Ranganatha, 1989). The natural habitat is disturbed for many reasons and the vegetation cover is declining now a day's worldwide (Kearns *et al.*, 1998). Agriculture plays a role in declining native pollinators through the modification and elimination of pollinator habitats and the use of agricultural chemicals including (pesticides, herbicides and fertilizers) (Donaldson, 2002). Free, 1993 stated that clean and intensive cultivation of land may affect wild insect pollinators. He mentioned practices such as destruction of hedgerows and rough verges, which destroyed many natural food sources and nesting sites of wild pollinating insects. Generally, it has been concluded that habitat degradation, pesticide misuse, diseases and intensive cultivation of lands may be the causes of decline in managed honeybees and wild pollinators (Gallai *et al.*, 2009). At present, it is grown in the area of about 1.8 lakh ha. (Duhoon, 2001). In addition, it is cultivated to limited extend in Ethiopia, South Africa, West Indies, Zimbabwe and India. In India, it is mainly cultivated in tribal pocket of M.P., Orissa, Maharashtra, Bihar, Karnataka and Andhra Pradesh. It is also grown sizeable area in certain region of Arunachal Pradesh,

Gujarat, U.P., Tamil Nadu and Rajasthan. Niger although considered as a minor oilseed, is very important in terms of quality and taste of its oil and export potential (Rajpurohit, 2011). Honeybee pollinators are estimated to be involved in producing up to 30 % of the human food supply directly or indirectly; farmers rely on managed honeybees throughout the world to provide these services (Greenleaf and Kremen, 2006). Honeybees are responsible for 70-80% of insect pollination (Johannsmeier and Mostert, 2001). The contribution of managed honeybee pollination to crop production and quality has been estimated to be more than the value of honey and wax production (Shrestha, 2004). Looking on significance in terms of oil extraction, which having high medicinal values but knowledge of the diseases of this Niger crop merits attention, Niger is a crop of dry areas grown mostly by tribal in interior places due to which desired attention has not been given on the biotic and abiotic stresses. Now the crop is gaining importance and studies are being made on to ascertain there is tremendous contribution of honey bees (*Aphis mellifera*) and many other insects, flies and butterflies in increasing the seed yield of Niger crop at the time of flowering (due to pollination) and its ultimately maximizes the income of farmers due to seed yield increase. Therefore a study was planned to document about the role of honeybees as a pollinator in increasing the seed yield in Niger crop with paired plot technique at the Niger Research Station (NRS) at Navsari Agricultural University (NAU) and at farmer's field, Vanarasi, Navsari, Gujarat and also studied its cost benefit ratio (CB) of the Niger cultivar.

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MATERIAL AND METHOD

Objective	:	To ascertain the contribution of Italian bee (<i>Apis mellifera</i>) in increasing the seed yield of crop
Location	:	Niger Research Station (NRS) and at farmer's field
Year of commencement	:	<i>Kharif</i> , 2014
Experimental details		
Treatment	:	01
Design	:	Pair Plot Technique
Replication	:	Non replicated
Plot size (Net) in meter	:	20 x 10 m
Spacing	:	-
Fertilizer NPK kg/ha	:	20:20:00
Date of sowing	:	08.08.2014
Date of Irrigation	:	30.09.2014
Date of harvesting	:	01.12.2014
No. of Weedings with dates	:	Two weedings 03.09.2014 & 12.10.2014
Previous crop	:	Fallow
Plant Protection measures adopted	:	-
Result	:	Table: 1

In addition, the research described in this AICRP project aimed to improve the understandings of the use of honeybee colonies in Niger cultivated crop pollination. The findings of this will therefore contribute to the definition of general guidelines to maintain or improve Niger crop pollination.

RESULT AND DISCUSSION

It is now apparent that most of the pulses and oilseeds, fruits and orchard crops including vegetables heavily depend on bees for their pollination. This is also true for seed production of vegetables like onion, cabbage, cauliflower, tobacco, sunnhemp, alfa alfa and clovers (http://agritech.tnau.ac.in/farm_enterprises/fe_api_be_e floraapollin.html). The number of colonies of honeybees required per hectare very much depends on the strength of foraging bees in the colony, the crops and prevailing weather conditions.

Significant differences were observed for number of capitula/plant, number of seeds/capitula, 1000 seed weight and seed yield in both the location. However, the seed yield and gross returns were considerably higher in first location of T1 Natural plot/ open pollinated with Bee hive (*Aphis mellifera*). The maximum seed yield of 275 Kg/ha with the gross

return of Rs. 16,500/- was obtained in this treatment. (Table: 1).

Qualities of honeybees, which make them good pollinators

- Body covered with hairs and has structural adaptation for carrying nectar and pollen.
- Bees do not injure the plants
- Adult and larva feed on nectar and pollen which is available in plenty
- Considered as superior pollinators, since store pollen and nectar for future use
- No diapauses is observed and needs pollen throughout the year
- Pollinate wide variety of crops
- Forage in extreme weather conditions

Management of bees for pollination

- Place hives very near the field source to save bee's energy
- Migrate colonies near field at 10 per cent flowering
- Place colonies at 3/ha for Italian bee and 5/ha for Indian honey bee
- The colonies should have 5 to 6 frame strength of bees, with sealed brood and young mated queen
- Allow sufficient space for pollen and honey storage

Table 1. Cost Benefit Ratio (CBR)

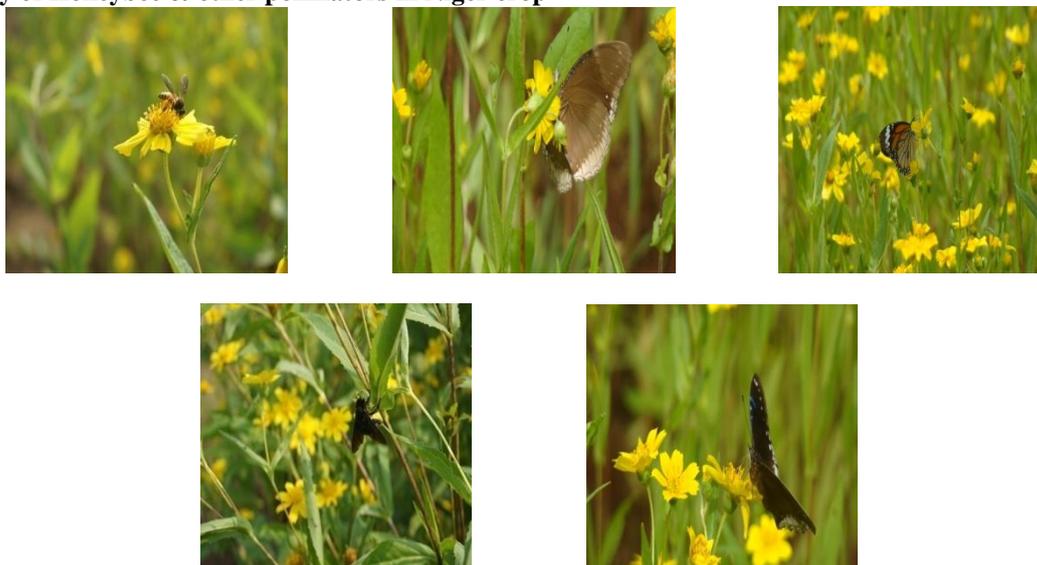
	Treatment	No. of Capitula/ Pl.	No. of Seeds/ Capitula	1000 Seed Weight (gm)	Seed Yield (Kg/ha)	Gross Returns (Rs.)	Cost of Cultivation	Net Income (Rs.)	BC Ratio
1 st Location (NRS)	T1 Natural plot/ open pollinated with Bee hive (Uncovered)	22	21	4.10	275	16500	9538	6962	1.72
	T2 Covered plot with bee hive (Covered)	18	16	4.00	238	14280	10538	3742	1.35
2 nd Location (Farmers Field)	T1 Open pollinated without bee hive	15	13	3.85	175	10500	7038	3462	1.49
	T2 Covered plot with bee hive (Covered)	17	14	3.95	225	13500	10538	2962	1.28

- Cost of Niger seed calculated Rs. 6000 per Quintal
- Cost of honey not included

Steffan-Dewenter and Tschardtke (1999) found that isolation from natural habitats diminishes abundance and species richness of bees, which are the most important flower-visiting insects. Honeybees were by far the most frequently recorded insects on onion flowers. The high proportion of honeybees compared to other insects visiting the flowers indicated that

honeybees were the major pollinators of the onion crop at our field site, with both honeybee abundance and seed yield and quality increasing proportionally. Similarly, Yucel and Duman (2005) reported that the germination rate was greater on average by 12% in onion with honeybee activity.

Activity of Honeybee & other pollinators in Niger crop



CONCLUSION

Insect pollinators such as honeybees increased the Niger seed yield and quality and also cost benefit ratio.

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