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SCREENING OF DIFFERENT GENOTYPES OF NIGER AGAINST NIGER APHID, *Uroleucon compositae* (THEOBALD)

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ABSTRACT

A field experiment was conducted during *Rabi* 2019-20 at the College Farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, to Screening of different twelve genotypes (VNMP-118, VNMP-218, VNMP-318, VNMP-418, VNMP-518, VNMP-618, VNMP-718, VNMP-818, RCR-317, GNNIG-3, Gujarat Niger (GN)-1, Gujarat Niger (GN) -2) of niger against niger aphid, *U. compositae*. Out of twelve tested genotypes/varieties of niger, the lowest population was recorded on VNMP - 418 (14.28 aphids/leaf) and Gujarat Niger-1 (14.59 aphids/leaf). Both genotypes/varieties were categorized as resistant against niger aphid, *U. compositae*. The remaining genotypes/varieties *viz*., VNMP - 518, RCR - 317 and variety Gujarat Niger - 2 were found moderately resistant. Genotypes/varieties *viz*., GNNIG - 3, VNMP - 118 and VNMP - 318 were categorized as susceptible with maximum aphid population.
Keywords **:** *U. compositae*, niger aphid, screening, niger, etc.

Introduction

Oilseeds crops occupy the second most importance in the Indian agricultural economy next to food grains in terms of area and production. Oilseed is the premier source of fat in the Indian diet and is used as a raw material for manufacturing a large number of items like paints, varnish, hydrogenated oils, soaps, perfumes, lubricants, *etc*. Niger [*Guizotia abyssinica* (L. f.) Cass.,] is an oilseed crop cultivated in Ethiopia, Germany, Brazil, Mexico and India. It constitutes about 50% of Ethiopian and 3% of Indian oilseed production. It is known by various names like *ramtil* or *kalatil* in India and *noog* in Ethiopia. The genus Guizotia consists of six species, of which five, including niger, are native to the Ethiopian highlands. The niger oil is a good absorbent of fragrance of flowers due to which it is used as a base oil by the perfume industry. Niger oils can be used for birth control and treatments of Syphilis (Salunkhe *et al.,* 1992). The seed contains about 40% oil with fatty acid composition of 75-80% linoleic acid, 7-8% palmitic and stearic acids, and 5-8% oleic acid and the Indian types contain 25% oleic and 55% linoleic acids (Nasirullah *et al*., 1982). An Two significant niger producing nations worldwide are Ethiopia and India. With almost 50% of the world's land and production, India is one of the fastest-growing nations. With an average yield of 290 kg/ha, Niger is grown on an area of 156.46 lakh per hectare, producing 45.42 lakh tonnes (Anonymous, 2019).

A total of 24 insects are recorded on niger in both Ethiopia and India. Of these the aphid [*Uroleucon compositae* (Theobald)] is most important to Indian context while nigerfly (*Dioxyna sororcula* and *Eutretosoma spp*.) and black pollen beetles (*Meligethes spp.*) are the most important in Ethopia. In recent, Trivedi *et al*. (2000) that have observed the diversity of aphid in south Gujarat and revealed that *U. compositae* had 7.16% relative abundance with 468 population index in Navsari district of south Gujarat.

In order to secrete a substance resembling honey dew on the leaves and other plant parts during the pre-flowering stage, both nymphs and adults suck the cell sap from shoot apices, peduncles, leaves, and stems.

Afterwards, the leaves developed a black sooty mould that inhibits photosynthetic activity, causing stunted growth. Consequently, the development of the necessary cure against *U. compositae* is urgently needed. The search for sources of insect pests resistance in crop plants and the use of varieties having such resistance in reducing the population of insects and the damage caused by them is one of the well-known approaches in plant protection research. All of our efforts are required to prevent yield losses brought on by these destructive pests, promote the cultivation of niger crop on a broad scale, and enhance production and productivity of oilseeds in India and Gujarat.

Materials and Methods

In order to Screening of different genotypes of niger against niger aphid, *U. compositae*. The present investigation was conducted during the *Rabi* season of 2019-20 at College Farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat. The weather during the growing season was normal and favourable for the crop growth. The experiment was laid out in a following randomized block design with three replications and twelve treatments. The different genotypes/varieties were sown on 2nd December with plot size of 1.50 m x 2.00 m and distance between row to row and plant to plant was 30 cm and 10 cm, respectively. Recommended agronomical practices were followed for raising the crop.

Table 1: List of genotypes used for the present investigation

Treatment	Genotypes /varieties	Treatment	Genotypes /varieties
T1	VNMP - 118	T7	VNMP - 718
T2	VNMP - 218	T8	VNMP - 818
T3	VNMP - 318	T9	RCR - 317
T4	VNMP - 418	T10	GNNIG -3
T5	VNMP - 518	T11	Gujarat Niger (GN) -1
T6	VNMP - 618	T12	Gujarat Niger (GN) -2

The observations were recorded from each genotype/variety. For the purpose, ten plants were randomly selected and tagged. The number of nymphs and adult of aphids was recorded from three leaves each one from top, middle and bottom at weekly interval starting from second week after sowing till the harvesting of crop.

Categorization of genotypes/varieties

The niger genotypes were categorized six categories of resistance to pest *viz.* highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible based on the population of pest per plant for the purpose mean value of individual variety $(\bar{x}_i)$ was compared with mean value of all genotypes $(\bar{x})$ and standard deviation (SD) following the modified scale adopted by Patel *et al.* (2002).

Table 2 : List of genotypes used for the present investigation

Category of resistance	Scale of resistance
Highly Resistant (HR)	$\bar{x}_i < (\bar{x} - 2\ SD)$
Resistant (R)	$\bar{x}_i > (\bar{X} - 2\ SD) < (\bar{x} - SD)$
Moderately Resistant (MR)	$\bar{x}_i > (\bar{X} - SD) < \bar{x}$
Moderately Susceptible (MS)	$\bar{x}_i > \bar{x} < (\bar{x} + SD)$
Susceptible (S)	$\bar{x}_i > (\bar{x} + SD) < (\bar{x} + 2\ SD)$
Highly Susceptible (HS)	$\bar{x}_i > (\bar{x} + 2\ SD)$

Result and Discussion

Experimental results are presented in Table 3 showed that none of the genotypes were found free from the aphid. The difference in aphid population on different genotypes was found significant. However, among all the genotypes of niger, the lowest population was recorded on VNMP – 418 (14.28 aphids/leaf). This was followed by Gujarat Niger -1 (14.59 aphids/leaf), VNMP-518 (17.57 aphids/leaf), RCR – 317 (17.82 aphids/leaf) and Gujarat Niger -2 (17.83 aphids/leaf). Among the evaluated genotypes, the population of aphids on VNMP - 218, VNMP - 618, VNMP - 818, VNMP - 718, GNNIG-3 and VNMP – 118 were 19.78, 20.00, 20.37, 21.30, 22.92 and 23.09 aphids/leaf, respectively. On the other hand, the highest population of aphid was observed in the plot of VNMP – 318 genotype (23.43 aphids/leaf). Thus, among the different genotypes, aphid population varied from 14.59 to 23.43 per leaf.

Categorization of genotypes for their susceptibility

Niger varieties were categorized as highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible based on the population of aphid. Details of genotypes/varieties of niger fall under respective category of susceptible are given in Table 4. The genotypes VNMP - 418 (14.28 aphids/leaf) and variety Gujarat Niger - 1 (14.59 aphids/leaf) were found resistant (R) recording by recording less than 16.46 aphids per leaf. Genotype VNMP - 518 (17.57 aphids/leaf), RCR - 317 (17.82 aphids/leaf) and variety Gujarat Niger - 2 (17.83 aphids/leaf) were found moderately resistant by recording population in between 16.46 and 19.42 aphids per leaf. Genotype VNMP - 218 (19.78 aphids/leaf), VNMP - 618 (20.00

aphids/leaf), VNMP - 818 (20.37 aphids/leaf), VNMP - 718 (21.30 aphids/leaf) were moderately susceptible which were registered less population than 22.37 but more than 19.42 aphids per leaf. Whereas, genotypes/varieties GNNIG - 3 (22.92 aphids/leaf), VNMP - 118 (23.09 aphids/leaf) and VNMP - 318 (23.43 aphids/leaf) categorized as susceptible having more than 22.37 aphids per leaf. The present investigation is tally with past worker Darandale (2013) who found that Gujarat Niger-1 recorded the lowest population of aphid which support the present findings. Godwal (2010) screened eleven genotypes of Indian bean against aphid, *A. craccivora* and reported that among eleven genotype, the lowest mean population of aphid was observed on genotype JDL-79-1 and VRSEM-11. Chouragade *et al.,* (2018) reported that among six cultivars, the lowest mean population of aphid was observed on genotype DOLVAR-4.

Table 3: Varietal screening of different genotypes against niger aphid, U. compositae (Rabi 2019-20)

Tr. No.	Genotypes	No. of aphids/leaf											
		4th WAS	5th WAS	6th WAS	7th WAS	8th WAS	9th WAS	10th WAS	11th WAS	12th WAS	13th WAS	14th WAS	Pooled
T_1	VNMP - 118	0.83 (0.70)	1.19 (1.43)	2.35 (5.53)	4.13 (17.20)	5.57 (31.13)	6.15 (37.93)	6.66 (44.50)	7.59 (57.63)	6.12 (37.50)	4.26 (18.13)	1.48 (2.30)	4.79 (23.09)
T_2	VNMP - 218	0.91 (0.83)	1.17 (1.40)	1.47 (2.20)	3.51 (12.40)	5.11 (26.17)	5.79 (33.67)	6.30 (39.77)	6.94 (48.30)	5.55 (31.10)	3.90 (15.27)	1.65 (2.80)	4.41 (19.78)
T_3	VNMP - 318	0.75 (0.57)	1.18 (1.40)	3.47 (12.10)	3.78 (14.33)	5.27 (27.87)	6.38 (40.83)	6.62 (44.03)	7.14 (50.97)	6.32 (40.33)	4.60 (21.23)	2.00 (4.00)	4.84 (23.43)
T_4	VNMP - 418	0.76 (0.60)	1.02 (1.03)	1.83 (3.40)	3.40 (11.77)	4.70 (22.17)	3.90 (15.40)	5.58 (30.17)	5.99 (35.97)	4.88 (23.87)	3.32 (11.13)	1.26 (1.60)	3.78 (14.28)
T_5	VNMP - 518	0.77 (0.60)	0.80 (0.63)	2.99 (8.93)	3.46 (12.03)	5.00 (25.20)	5.09 (26.20)	5.60 (31.60)	6.07 (37.83)	5.49 (30.27)	3.96 (15.83)	2.04 (4.17)	4.17 (17.57)
T_6	VNMP - 618	0.88 (0.77)	1.12 (1.27)	1.47 (2.20)	3.48 (12.23)	5.02 (25.30)	5.68 (32.87)	6.28 (39.60)	6.95 (49.37)	6.00 (36.17)	4.23 (18.00)	1.49 (2.23)	4.45 (20.00)
T_7	VNMP - 718	0.89 (0.80)	1.05 (1.10)	1.53 (2.43)	3.95 (15.63)	5.27 (28.03)	5.39 (29.13)	6.45 (41.83)	7.42 (55.63)	6.08 (37.83)	4.42 (19.60)	1.49 (2.23)	4.61 (21.30)
T_8	VNMP - 818	0.73 (0.53)	1.08 (1.20)	1.86 (3.47)	3.94 (15.50)	5.41 (29.43)	5.19 (27.43)	6.42 (41.33)	7.33 (53.97)	5.68 (32.27)	4.00 (16.07)	1.69 (2.87)	4.48 (20.37)
T_9	RCR - 317	0.91 (0.83)	1.15 (1.33)	1.24 (1.63)	3.50 (12.30)	5.37 (28.97)	5.18 (27.03)	5.86 (34.60)	6.60 (43.90)	5.40 (29.27)	3.73 (14.00)	1.49 (2.23)	4.20 (17.82)
T_{10}	GNNIG – 3	0.93 (0.87)	1.15 (1.33)	1.69 (2.87)	4.16 (17.37)	5.61 (31.57)	5.78 (33.60)	6.66 (44.43)	7.58 (57.60)	6.29 (39.87)	4.48 (20.20)	1.55 (2.43)	4.78 (22.92)
T_{11}	Gujarat Niger - 1	0.75 (0.57)	1.01 (1.03)	1.81 (3.27)	3.39 (11.53)	4.07 (16.73)	4.33 (19.07)	5.68 (32.77)	6.14 (37.97)	4.95 (24.50)	3.35 (11.37)	1.30 (1.70)	3.80 (14.59)
T_{12}	Gujarat Niger - 2	0.75 (0.57)	0.99 (1.00)	1.56 (2.43)	4.16 (17.40)	5.05 (25.53)	5.29 (28.00)	5.73 (33.03)	6.43 (41.40)	5.35 (28.87)	4.00 (16.10)	1.26 (1.60)	4.21 (17.83)
S. Em ± (T)		0.04	0.07	0.13	0.19	0.25	0.32	0.28	0.39	0.31	0.23	0.11	0.07
S. Em ± (P x T)		-	-	-	-	-	-	-	-	-	-	-	0.24
C.D. at 5% (T)		0.13	0.21	0.38	0.58	0.74	0.95	0.83	1.15	0.92	0.68	0.33	0.21
C.D. at 5% (P x T)		-	-	-	-	-	-	-	-	-	-	-	0.67
C.V. (%)		9.70	11.87	11.81	9.19	8.61	10.54	8.02	9.93	9.63	10.07	12.54	11.90

Figures inside parentheses are retransformed values, while outsides are $\sqrt{x+0.5}$ transformed values; WAS = Week After Sowing

Table 4: Categorization of different genotypes/cultivars of niger for their susceptibility against *U. compositae* (*Rabi* 2019-20)

Category of resistance	Scale	Varieties
Population of aphid/leaf	$\overline{X}$ = 19.42	SD= 2.96
Highly Resistant (HR)	$\overline{X}_i$ < 13.50	-
Resistant (R)	13.50 < $\overline{X}_i$ < 16.46	VNMP - 418 (14.28) Gujarat Niger - 1 (14.59)
Moderately Resistant (MR)	16.46 < $\overline{X}_i$ < 19.42	VNMP - 518 (17.57) RCR - 317 (17.82) Gujarat Niger - 2 (17.83)

Moderately Susceptible (MS)	$19.42 < \overline{X}_i < 22.37$	VNMP - 218 (19.78) VNMP - 618 (20.00) VNMP - 818 (20.37) VNMP - 718 (21.30)
Susceptible (S)	$22.37 < \overline{X}_i < 25.33$	GNNIG - 3 (22.92) VNMP - 118 (23.09) VNMP - 318 (23.43)
Highly Susceptible (HS)	$\overline{X}_i > 25.33$	-

Conclusion

An investigation on screening of different genotypes against niger aphid, *U. compositae* revealed that the lowest population was recorded on VNMP - 418 (14.28 aphids/leaf) and Gujarat Niger -1 (14.59 aphids/leaf). Both genotypes/varieties were found resistant. Genotype VNMP - 518, RCR - 317 and variety Gujarat Niger -2 were recorded 17.57, 17.82 and 17.83 aphids/leaf, respectively and it was fall in category of moderately resistant. However, Genotype of VNMP - 218 (19.78 aphids/leaf), VNMP - 618 (20.00 aphids/leaf), VNMP - 818 (20.37 aphids/leaf), VNMP - 718 (21.30 aphids/leaf) were registered as moderately susceptible. While, genotypes/cultivars *viz*., GNNIG - 3 (22.92 aphids/leaf), VNMP - 118 (23.09 aphids/leaf) and VNMP - 318 (23.43 aphids/ leaf) were categorized as susceptible (22.37 aphids/ leaf).

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