Screening of different genotypes of Niger (*Guizotiaabyssinica*Cass) against major insect pests

Abstract

An experiment was conductedduring Pre-*Rabi* season in the year 2020-21, at Project Coordinating Unit Sesame and Niger, Jawaharlal Nehru KrishiVishwaVidyalaya, Jabalpur (M.P.).Ecompassedof 21 promising genotypes of Niger which were screened for resistance/susceptibility against whiteflies, leafhoppers, and capsule fly. The genotypes JNS-28, JNS-9, JNC-6, NRS-1805, IGPN-15-02 and NRS-1513 were found promising against whitefly. The genotypes JNS-2017-8, IGPN-15-02, NRS-1513, NRS-1511 and JNS-2017-1 were found promising against the incidence of leafhopper. The genotypes DNS-19-24, JNS-2017-8, JNS-2016-1115, NRS-1513 and NRS-1807 were found promising against capsule fly.

Keyword: Screening, susceptibility, genotypes JNS-2017-8 and 21 promising genotypes.

1. Introduction

Niger (*Guizotiaabyssinica*) is an economically important edible oilseed crop. It is crucial minor oilseed crop having therapeutic properties mainly grown in India and Ethopia. Niger is a diploid (2n = 2x = 30), oil crop species belongs to Asteraceae family. It is an annual crop with a capitulum that consists of six to eight fertile female ray florets and 40–60 hermaphroditic disk florets . The corymbs cymes of heads, 5 broadly ovate-obovate outer involucral leaves, 5-nerved paleaeand bigger achenes, are its main discriminating characters from other Guizotia species. Niger is a strictly outcrossing species with a sporophyticselfincompatibility mechanismand is mainly pollinated by insects. The earlist name given to this plant was *Verbesinaoleifera*. Niger (*Guizotiaabyssinica*L.f.Cass) is an important minor oilseed crop of India which developed mainly in hilly and tribal areas. It is nutritious in terms of its 38 to 42% of quality oil with 18 to 20% protein in the seed. It is the lifeline of tribal agriculture and economy in India (Panday*et al.*, 2014). An integrated pest management strategy, to increase the efficiency of fertilizer use, is being developed. Yield losses, due to various diseases and insect pests in different states, have been assessed and a management schedule for major insect pests (niger caterpillar, nigercapsule fly, cutworms, semi looper, Bihar hairy caterpillar, and aphids). One of the hurdle in the production of Niger is the massive damage caused by several insect pests under certain agro production situations. Niger crop is attacked by 24 of insect-pestsspecies from germination to till the harvest in both Ethiopia and India. The niger capsule fly is the most serious insect pest, both in Ethopia and India. Cultivar resistance has been identyfied as the most desirable and economic tactics in the management of insect pests and is the best alternative to synthetic insecticides, providing an eco-friendly, environmentally safe strategy for fruitful management of insect pests. It couldbe united into ecologically sound integrated pest management programmes. Before evolving insect pest management programme for a specific agro-ecosystem, it is obligatory to have basic information on the occurance of the pests in relation to weather parameters which helps in discovering appropriate time of action and suitable method of management.

2. Materials and methods

Experiment was designed in Randomized Block Design (RBD) with three replications, with 21 genotypes. For the screening of different promising genotypes against major insect pests 21 promisinggenotypes were grown in three replications. weeklyobservations were takenstarted from 15 days after sowing till the harvesting of crop. From each genotype five plants were selected randomly for recordingthe observations. The population of sucking insect pests (leafhopper and whitefly) wereobserved by counting the number of nymphs and adult on threeleaves/plant from top, middle and bottom of the plants. The population of capsule fly was recordedby counting the number of adult per plant.

3. Results and discussion

The aggregate of average population data of whitefly showed that all the genotypes differed significantly in respect to record the whitefly population per three leaves per plant. Among the screened genotypes the minimal population of whitefly (1.32 whitefly/three leaves) was reported from the genotype JNS-28 succeeded by (1.63 whitefly/three leaves) JNC-6 and JNS-9 (1.43 whitefly/three leaves) while the highest population (2.78 whitefly/three leaves) was recorded from the genotype JNS-2017-1 followed by (2.29 whitefly/three leaves) NRS-1511 and IGPN-2004-1 (2.28 whitefly/three leaves). The genotypes JNS-28, JNS-9, JNC-6, NRS-1805, IGPN-15-02, NRS-1513, JNS-2016-1115, DNS-19-24, IGPN-17-02 and JNS-2016-1413 were found at par to each other in respect to record the lowest population of whitefly. Present findings are in conformity with the findings of Tembhre (2005), whoscreened 78 germplasms lines of niger for resistance/susceptibility against major insect pests and reported that the entry N-KEC-7 was found highly susceptible against *B. tabaci*. Present findings are also supported by the findings of Ranganatha*et al.*, (2016) that the genotype N-6 and N-11 were found to be tolerant against whitefly.

Table 1: Response of different genotypes of niger against whitefly

S. No.	Genotypes	White fly population/three leaves Days after sowing (DAS)								Overall mean
		15	22	29	36	43	50	57	64	
1	JNS-2017-1	3.27 (1.94)	3.16 (1.91)	3.37 (1.96)	3.00 (1.86)	3.24 (1.93)	2.90 (1.84)	2.06 (1.57)	1.29 (1.33)	2.78 (1.81)
2	NRS-1511	3.00 (1.87)	2.80 (1.82)	2.80 (1.81)	2.00 (1.58)	2.60 (1.75)	2.63 (1.76)	1.53 (1.42)	1.01 (1.22)	2.29 (1.67)
3	JNS-2017-8	3.60 (2.02)	2.60 (1.76)	1.93 (1.56)	2.47 (1.72)	1.41 (1.38)	2.10 (1.59)	1.35 (1.35)	0.97 (1.21)	2.05 (1.59)
4	NRS-1513	2.53 (1.74)	1.80 (1.52)	1.53 (1.42)	2.33 (1.68)	1.66 (1.46)	1.34 (1.35)	1.53 (1.42)	1.00 (1.22)	1.71 (1.48)
5	JNS-2017-13	2.73 (1.80)	2.67 (1.78)	2.40 (1.70)	2.60 (1.75)	1.90 (1.54)	1.09 (1.26)	1.50 (1.41)	1.35 (1.36)	2.03 (1.59)
6	IGPN-15-02	1.60 (1.45)	2.34 (1.68)	2.47 (1.72)	1.37 (1.37)	1.88 (1.54)	1.20 (1.30)	1.33 (1.35)	1.20 (1.30)	1.67 (1.47)
7	JNS-2017-17	3.53 (2.01)	3.27 (1.93)	2.47 (1.72)	1.87 (1.53)	1.93 (1.56)	1.40 (1.37)	1.55 (1.43)	1.16 (1.29)	2.14 (1.62)
8	IGPN-17-02	1.47 (1.40)	2.27 (1.66)	2.93 (1.84)	2.07 (1.60)	1.93 (1.56)	1.05 (1.23)	1.78 (1.51)	1.09 (1.26)	1.82 (1.52)
9	JNC-6	1.40 (1.38)	2.27 (1.66)	1.27 (1.33)	1.53 (1.42)	1.80 (1.52)	2.13 (1.62)	1.46 (1.40)	1.21 (1.31)	1.63 (1.46)
10	ONS-182	2.80 (1.82)	2.60 (1.76)	2.00 (1.57)	2.27 (1.65)	1.65 (1.46)	1.40 (1.37)	1.51 (1.41)	0.86 (1.16)	1.89 (1.55)

11	JNS-28	1.01 (1.23)	1.47 (1.40)	2.07 (1.60)	1.80 (1.52)	1.37 (1.36)	1.07 (1.25)	0.94 (1.20)	0.78 (1.13)	1.32 (1.35)
12	ONS-183	2.13 (1.62)	2.73 (1.80)	2.53 (1.74)	2.93 (1.85)	1.87 (1.53)	1.33 (1.34)	1.09 (1.26)	0.98 (1.21)	1.95 (1.57)
13	JNS-2016-1115	3.00 (1.87)	2.60 (1.76)	2.07 (1.60)	1.34 (1.35)	2.03 (1.58)	1.30 (1.33)	0.97 (1.21)	0.94 (1.20	1.78 (1.51)
14	NRS-1804	2.40 (1.70)	2.93 (1.85)	3.27 (1.94)	2.33 (1.68)	1.66 (1.47)	2.33 (1.68)	1.17 (1.29)	1.26 (1.32)	2.17 (1.63)
15	DNS-19-24	2.20 (1.64)	1.73 (1.49)	2.33 (1.68)	2.53 (1.74)	1.85 (1.53)	1.30 (1.34)	1.13 (1.27)	1.17 (1.29)	1.78 (1.51)
16	NRS-1805	1.27 (1.32)	1.87 (1.53)	2.40 (1.70)	2.26 (1.66)	1.86 (1.54)	1.39 (1.38)	1.26 (1.32	1.08 (1.26)	1.67 (1.47)
17	JNS-2016-1413	3.13 (1.90)	2.47 (1.72)	1.80 (1.51)	1.67 (1.47)	1.63 (1.45)	1.47 (1.39)	1.40 (1.37)	1.31 (1.34)	1.86 (1.54)
18	NRS-1807	2.53 (1.74)	2.87 (1.82)	2.07 (1.60)	2.47 (1.72)	1.90 (1.54)	1.93 (1.56)	1.36 (1.36)	1.26 (1.32)	2.05 (1.59)
19	JNS-9	1.13 (1.27)	1.60 (1.45)	0.87 (1.60)	1.93 (1.54)	1.73 (1.49)	1.73 (1.49)	1.45 (1.39)	1.00 (1.22)	1.43 (1.38)
20	VNS-1802	3.07 (1.89)	2.67 (1.77)	1.93 (1.56)	1.27 (1.33)	1.62 (1.45)	2.40 (1.69)	1.80 (1.51)	1.15 (1.28)	1.98 (1.57)
21	IGPN-2004-1	2.67 (1.78)	2.67 (1.78)	2.80 (1.82)	2.81 (1.81)	2.28 (1.67)	2.53 (1.74)	1.46 (1.39)	1.03 (1.24)	2.28 (1.67)
SE(m)±		0.05	0.07	0.08	0.09	0.06	0.09	0.07	0.04	0.068
CD at 5%		0.14	0.20	0.22	0.25	0.18	0.25	0.19	0.13	0.195

* Figures in parenthesis are square root transformed value

3.1. Leafhopper (*Amrasca*sp.)

Among the screened genotypes the lowest population of leafhopper (0.83 leafhopper/three leaves) was recorded from the genotype JNS-2017-8 followed by (0.86 leafhopper/three leaves) IGPN-15-02.Among the screened genotype the highest population of leafhopper (1.68 leafhopper/three leaves) was received from the genotype JNS-2016-1413 followed by (1.48 leafhopper/three leaves) IGPN-2004-1 and (1.40 leafhopper/three leaves) NRS-1804. The genotypes JNS-2017-8, IGPN-15-02, NRS-1513, NRS-1511, JNS-2017-1, JNS-2017-13, IGPN-17-02, JNC-6, ONS-182, JNS-28, NRS-1805, NRS-1807, JNS-9 and VNS-1802 were found at par to each other in respect to record the leafhopper population/three leaves. Similarity the genotypes JNS-2016-1413, DNS-19-24, NRS-1804, JNS-2017-17 and IGPN-2004-1 were also found at par to each other in respect to record the leafhopper population/three leaves.

3.2. Capsule fly

The results of average population data of capsule fly revealed that all the genotypes were differed to each other in respect to record the capsule fly population per plant. Among the screened genotypes the lowest population of capsule fly (1.11 adult /plant) was recorded from the genotype DNS-19-24 followed by (1.32 capsule fly/plant) JNS-2017-8 and JNS-2016-1115 (1.34 capsule fly/ plant). Among the screened genotype the highest population of capsule fly (2.58 capsule fly/plant) was received from the genotypeJNS-2017-1 followed by (2.07 capsule fly/plant) JNS-2017-13 and NRS-1511 (1.92 capsule fly/plant), JNS-2017-17 (1.92capsule fly/plant).The genotypes DNS-19-24, JNS-2017-8,JNS-2016-1115,NRS-1513, NRS-1807,JNS-2016-1413, ONS-182, ONS-183, IGPN-15-02,NRS-1805 and IGPN-17-02were found at par to each other in respect to record the lowest population of capsule fly. Similarly the genotype JNS-2017-1, JNS-2017-17, NRS-1511, JNS-2017-17, JNS-9 and IGPN-2004-1, were found at par to each other in respect to record the population of capsule fly.

Table 2: Response of different genotypes of nigeragainst whitefly

S. No.	Genotypes	White fly population/three leaves/plant Days after sowing (DAS)								Overall mean
		15	22	29	36	43	50	57	64	
1	JNS-2017-1	3.27 (1.94)	3.16 (1.91)	3.37 (1.96)	3.00 (1.86)	3.24 (1.93)	2.90 (1.84)	2.06 (1.57)	1.29 (1.33)	2.78 (1.81)
2	NRS-1511	3.00 (1.87)	2.80 (1.82)	2.80 (1.81)	2.00 (1.58)	2.60 (1.75)	2.63 (1.76)	1.53 (1.42)	1.01 (1.22)	2.29 (1.67)
3	JNS-2017-8	3.60 (2.02)	2.60 (1.76)	1.93 (1.56)	2.47 (1.72)	1.41 (1.38)	2.10 (1.59)	1.35 (1.35)	0.97 (1.21)	2.05 (1.59)
4	NRS-1513	2.53 (1.74)	1.80 (1.52)	1.53 (1.42)	2.33 (1.68)	1.66 (1.46)	1.34 (1.35)	1.53 (1.42)	1.00 (1.22)	1.71 (1.48)
5	JNS-2017-13	2.73 (1.80)	2.67 (1.78)	2.40 (1.70)	2.60 (1.75)	1.90 (1.54)	1.09 (1.26)	1.50 (1.41)	1.35 (1.36)	2.03 (1.59)
6	IGPN-15-02	1.60 (1.45)	2.34 (1.68)	2.47 (1.72)	1.37 (1.37)	1.88 (1.54)	1.20 (1.30)	1.33 (1.35)	1.20 (1.30)	1.67 (1.47)
7	JNS-2017-17	3.53 (2.01)	3.27 (1.93)	2.47 (1.72)	1.87 (1.53)	1.93 (1.56)	1.40 (1.37)	1.55 (1.43)	1.16 (1.29)	2.14 (1.62)
8	IGPN-17-02	1.47 (1.40)	2.27 (1.66)	2.93 (1.84)	2.07 (1.60)	1.93 (1.56)	1.05 (1.23)	1.78 (1.51)	1.09 (1.26)	1.82 (1.52)
9	JNC-6	1.40 (1.38)	2.27 (1.66)	1.27 (1.33)	1.53 (1.42)	1.80 (1.52)	2.13 (1.62)	1.46 (1.40)	1.21 (1.31)	1.63 (1.46)
10	ONS-182	2.80 (1.82)	2.60 (1.76)	2.00 (1.57)	2.27 (1.65)	1.65 (1.46)	1.40 (1.37)	1.51 (1.41)	0.86 (1.16)	1.89 (1.55)
11	JNS-28	1.01 (1.23)	1.47 (1.40)	2.07 (1.60)	1.80 (1.52)	1.37 (1.36)	1.07 (1.25)	0.94 (1.20)	0.78 (1.13)	1.32 (1.35)
12	ONS-183	2.13 (1.62)	2.73 (1.80)	2.53 (1.74)	2.93 (1.85)	1.87 (1.53)	1.33 (1.34)	1.09 (1.26)	0.98 (1.21)	1.95 (1.57)
13	JNS-2016-1115	3.00 (1.87)	2.60 (1.76)	2.07 (1.60)	1.34 (1.35)	2.03 (1.58)	1.30 (1.33)	0.97 (1.21)	0.94 (1.20	1.78 (1.51)
14	NRS-1804	2.40 (1.70)	2.93 (1.85)	3.27 (1.94)	2.33 (1.68)	1.66 (1.47)	2.33 (1.68)	1.17 (1.29)	1.26 (1.32)	2.17 (1.63)
15	DNS-19-24	2.20 (1.64)	1.73 (1.49)	2.33 (1.68)	2.53 (1.74)	1.85 (1.53)	1.30 (1.34)	1.13 (1.27)	1.17 (1.29)	1.78 (1.51)
16	NRS-1805	1.27	1.87	2.40	2.26	1.86	1.39	1.26	1.08	1.67

		(1.32)	(1.53)	(1.70)	(1.66)	(1.54)	(1.38)	(1.32	(1.26)	(1.47)
17	JNS-2016-1413	3.13 (1.90)	2.47 (1.72)	1.80 (1.51)	1.67 (1.47)	1.63 (1.45)	1.47 (1.39)	1.40 (1.37)	1.31 (1.34)	1.86 (1.54)
18	NRS-1807	2.53 (1.74)	2.87 (1.82)	2.07 (1.60)	2.47 (1.72)	1.90 (1.54)	1.93 (1.56)	1.36 (1.36)	1.26 (1.32)	2.05 (1.59)
19	JNS-9	1.13 (1.27)	1.60 (1.45)	0.87 (1.60)	1.93 (1.54)	1.73 (1.49)	1.73 (1.49)	1.45 (1.39)	1.00 (1.22)	1.43 (1.38)
20	VNS-1802	3.07 (1.89)	2.67 (1.77)	1.93 (1.56)	1.27 (1.33)	1.62 (1.45)	2.40 (1.69)	1.80 (1.51)	1.15 (1.28)	1.98 (1.57)
21	IGPN-2004-1	2.67 (1.78)	2.67 (1.78)	2.80 (1.82)	2.81 (1.81)	2.28 (1.67)	2.53 (1.74)	1.46 (1.39)	1.03 (1.24)	2.28 (1.67)
	SE(m)±	0.05	0.07	0.08	0.09	0.06	0.09	0.07	0.04	0.068
	CD at 5%	0.14	0.20	0.22	0.25	0.18	0.25	0.19	0.13	0.195

* Figures in parenthesis are square root transformed value.

Table 3: Response of different genotypes of niger against capsule fly

S. No.	Genotypes	Capsule fly population/plant Days after sowing (DAS)				Overall mean
		45	52	59	66	
1	JNS-2017-1	2.80 (1.80)	3.01 (1.87)	2.69 (1.78)	1.82 (1.52)	2.58 (1.75)
2	NRS-1511	2.67 (1.78)	1.70 (1.48)	2.01 (1.58)	1.29 (1.33)	1.92 (1.56)
3	JNS-2017-8	1.40 (1.37)	1.20 (1.33)	1.28 (1.37)	1.21 (1.28)	1.32 (1.34)
4	NRS-1513	1.74 (1.49)	1.20 (1.30)	1.28 (1.27)	1.21 (1.30)	1.36 (1.36)
5	JNS-2017-13	2.60 (1.76)	2.53 (1.74)	1.90 (1.53)	1.25 (1.31)	2.07 (1.60)
6	IGPN-15-02	1.74 (1.49)	1.40 (1.38)	1.48 (1.36)	1.37 (1.37)	1.50 (1.41)
7	JNS-2017-17	3.20 (1.92)	1.33 (1.34)	1.82 (1.50)	1.32 (1.34)	1.92 (1.55)
8	IGPN-17-02	1.74 (1.49)	1.27 (1.32)	1.49 (1.40)	1.37 (1.36)	1.46 (1.40)
9	JNC-6	1.74 (1.49)	2.33 (1.68)	1.79 (1.50)	1.36 (1.36)	1.80 (1.52)
10	ONS-182	1.26 (1.32)	1.45 (1.39)	1.98 (1.57)	1.34 (1.35)	1.50 (1.41)
11	JNS-28	2.40 (1.70)	1.20 (1.30)	2.07 (1.59)	1.11 (1.26)	1.69 (1.48)
12	ONS-183	1.54 (1.40)	1.42 (1.38)	1.75 (1.47)	1.22 (1.30)	1.48 (1.41)
13	JNS-2016-1115	1.00 (1.22)	1.26 (1.32)	1.94 (1.55)	1.17 (1.29)	1.34 (1.35)
14	NRS-1804	1.73 (1.49)	2.13 (1.62)	1.81 (1.50)	1.34 (1.35)	1.75 (1.50)
15	DNS-19-24	1.13 (1.27)	1.01 (1.23)	1.28 (1.33)	1.02 (1.23)	1.11 (1.27)
16	NRS-1805	2.40 (1.70)	1.34 (1.34)	1.26 (1.32)	1.04 (1.24)	1.51 (1.42)
17	JNS-2016-1413	1.46 (1.39)	1.65 (1.47)	1.55 (1.43)	1.28 (1.33)	1.49 (1.41)
18	NRS-1807	1.73 (1.49)	1.25 (1.32)	1.42 (1.39)	1.16 (1.18)	1.39 (1.37)
19	JNS-9	2.80 (1.81)	2.40 (1.70)	1.34 (1.35)	1.06 (1.17)	1.90 (1.55)
20	VNS-1802	1.34 (1.35)	1.81 (1.52)	1.63 (1.45)	1.97 (1.57)	1.69 (1.48)
21	IGPN-2004-1	2.46 (1.72)	1.98 (1.58)	1.46 (1.41)	1.54 (1.42)	1.86 (1.54)
	SE(m)±	0.08	0.05	0.10	0.06	0.07
	CD at 5%	0.22	0.15	0.29	0.18	0.21

* Figures in parenthesis are square root transformed value.

4. Conclusions

The 21 promising genotypes of Niger were screened for resistance/susceptibility against whiteflies, leafhoppers, and capsule fly.It is assessed that the genotypes JNS-28, JNS-9, JNC-6, NRS-1805, IGPN-15-02 and NRS-1513 were found promising against whitefly. The genotypes JNS-2017-8, IGPN-15-02, NRS-1513, NRS-1511 and JNS-2017-1 were found promising against the incidence of leafhopper. The genotypes DNS-19-24, JNS-2017-8, NS-2016-1115, NRS-1513 and NRS-1807 were found promising against capsule fly. It has been concluded that JNS-2017-1 genotype is highly resistant to whitefly and capsule fly and JNS-2016-1413 was resistant to Leafhopper. JNS-28, JNS-2017-8, DNS-19-20 were susceptible genotype with respect to whitefly, leafhopper and capsule fly.

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