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Screening of Ginger Genotypes for Shoot Borer (*Conogethes punctiferalis* Guen.) Resistance under Soppinabetta Ecosystem of Karnataka, India

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A B S T R A C T

Sixteen ginger (*Zingiber officinale* Rose.) genotypes including popular cultivars and high yielding varieties were screened in the field against the shoot borer (*Conogethes punctiferalis* Guen.) at the farm field of the division of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Sirsi, Karnataka. All the genotypes were susceptible to the pest attack. None of the genotypes was rated as resistant, whereas, 4, 7, 5 and none of genotypes were rated as moderately resistant, moderately susceptible, susceptible and highly susceptible, respectively to the pest incidence.

Introduction

Ginger *(Zingiber officinale* Rosc.) is an important spice and medicinal crop, is mainly grown in Nigeria, India, China, Indonesia, Thailand and Nepal. In India, it is grown in an area of 1,65,000 hectares with an annual production of 10,81,000 MT with productivity of 6.57 MT per hectare (Anon., 2017). More than 30 species of insects have been reported to infest the crop in India including under storage, among which, shoot borer *(Conogethes punctiferalis* Guen.) (Pyralidae: Lepidoptera) is the most serious pest (Devasahayam and Koya, 2004). Adult moth lays eggs on the tender unopened leaf and the larvae on hatching scrape and feed on the green contents of the leaf; later they bore into the shoots and feed on the inner core, resulting in withered shoots. The yield of the crop is significantly affected when more than 45% of the shoots in a clump are damaged by the pest (Koya *et al.,* 1986). Intensive use of pesticides in the field for the management of the pest could result in pesticide residues in the produce, and may also cause harm to the ecosystem. Host resistance is one of the component in any disease management

programme. It is the most economical and safest method for disease management. Hence, development of resistant varieties and their incorporation in IPM schedules is a viable alternative for management of this pest. Keeping the above in view, the collected ginger genotypes were screened for their resistance/susceptibility to the shoot borer.

Materials and Methods

Screening of 16 ginger genotypes including popular cultivars and high yielding varieties against the shoot borer was carried out during 2014-15 at the farm field of the division of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Sirsi, Karnataka (14.26°N and 74.5°E, 619 meters above MSL, mean annual rainfall 2353 mm).

The Rhizomes (20-25 g size) of each genotype were planted in raised bed of 3.00 m length, 1.0 m width and 15 cm height at a spacing of 30 cm × 20 cm. and replicated twice. All agronomic practices were followed as per the package of practice recommended by UHS, Bagalkot (Anon., 2013).

The number of damaged (dead hearts/shoots with the characteristic bore hole) and healthy shoots were recorded in each genotype when the symptoms of pest damage reached its peak. Scoring of pest incidence (shoot borer) was done at 90, 120 and 150 days after planting and calculated by using this formula.

$$\text{Pest incidence (\%)} = \frac{\text{Total number of affected plants}}{\text{Total number of plants}} \times 100$$

Results and Discussion

The rating of different ginger genotypes to the shoot borer at 90, 120 and 150 days after planting indicated that, the genotypes like Humanabad Local (7.35%, 8.88% and 10.00% incidence), Bidar-2 (10.00%, 11.00% and 12.88% incidence) and Rio-de-Janeiro (9.50%, 11.55% and 13.85% incidence) found tolerant to the incidence of Shoot borer. Whereas the genotype IISR- Varada is susceptible to shoot borer and recorded significantly higher incidence (19.35%, 20.26% and 21.76% incidence) which was on par with Suravi (17.30%, 18.75% and 19.38% incidence). These results are comparable with minimum shoot borer incidence reported at IISR Kerala, with 21.8 % incidence was reported in the genotype IISR- Varada (Devasahayam *et al.,* 2010 and Senapati and Ghose, 2005).

The study indicated that none of the ginger genotypes screened was highly resistant to the shoot borer; however, all the genotypes were susceptible to the pest attack. Whereas, four genotypes were rated as moderately resistant (0.1% to 12.5% range of shoot damage), seven genotypes were rated as moderately susceptible (12.6% to 17.1% range of shoot damage), five genotypes were rated as susceptible (17.2% to 21.8% range of shoot damage) and none of the genotypes were rated as highly susceptible to the pest. Since the variation in the per cent shoot damage between various genotypes was wide.

The mean and standard deviation of the maximum shoot damage was used for fixing various categories of resistance/susceptibility. The categorization based on the extent of variation from the mean (positive or negative) reduced the probabilities of inclusion of pseudo resistant susceptible genotypes (Bhumanavar *et al.,* 1989).

The four genotypes which exhibited a moderately resistant reaction in the present study provides the breeders with a wide choice of breeding lines for developing ginger varieties resistant to the shoot borer. Further these genotypes can be used for cultivation under shoot borer prone areas (Table 1 and 2).

Table.1 Reaction of different ginger genotypes to shoot borer (*Conogethes punctiferalis* Guen) incidence

Category of resistance	Range of shoot damage (%)	Number of genotypes
Highly resistant	0	Nil
Moderately resistant	0.1 - 12.5	4
Moderately susceptible	12.6 - 17.1	7
Susceptible	17.2 - 21.8	5
Highly susceptible	> 21.8	Nil

Table.2 Shoot borer incidence indifferent ginger genotypes under Soppinabetta ecosystem of Karnataka

Sl. No.	Genotypes	Shoot borer incidence (%)		
		90 DAP	120 DAP	150 DAP
1	Suprabha	14.88	17.73	19.39
2	IISR-Mahima	14.75	16.28	18.50
3	Karkala Local	11.30	12.90	14.73
4	Humnabad Local	7.35	8.88	10.00
5	Himagiri	15.00	17.73	20.00
6	IISR-Varada	19.35	20.26	21.76
7	Suravi	17.30	18.75	19.38
8	Shikaripura Local	13.63	15.23	16.63
9	Suruchi	13.13	16.89	19.23
10	Jorhat-1	11.00	13.28	16.85
11	Himachal	12.50	14.33	17.85
12	Rio-de-Janeiro	9.50	11.55	13.85
13	IISR-Rajatha	14.00	16.73	17.88
14	Bidar-1	10.50	11.23	14.68
15	Jorhat-2	12.50	13.25	15.80
16	Bidar-2	10.00	11.00	12.88
	S.Em ±	1.11	0.78	0.72
	CD (0.05)	3.34	2.35	2.17
	CV (%)	12.08	7.39	5.94

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