



Screening of Gerbera Cultivars against Root-Knot Nematode *Meloidogyne incognita*

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: To find out the source of resistance against root-knot nematode, *Meloidogyne incognita* in different gerbera cultivars and their evaluation.

Study Design: Completely Randomized Design.

Place and Duration of Study: Biswanath College of Agriculture, Biswanath Chariali, Assam during rabi season 2023.

Methodology: Suckers of six gerbera cultivars were planted in pots and were inoculated with freshly hatched second stage juveniles of *M. incognita* (1 J₂/cm³ soil) fifteen days after planting.

Results: Upon observation 2 months after inoculation results showed that three cultivars viz. Pink Melody, Red Seven and Arka Krishika were recorded as susceptible with gall index 3.6, 3.6 and 3.4 respectively. Other three cultivars viz. Orange Sun Brust, Pride of Sikkim and Saffron were

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recorded as moderately resistant with gall index 3.0. Upon evaluation the cultivar Orange Sun Brut recorded maximum plant growth parameters followed by the cultivar Saffron and minimum plant growth parameters were recorded in the cultivar Pink Melody.

Conclusion: From this experiment it is concluded that no one cultivar found to be resistant against root-knot nematode. Three cultivars were found to be moderately resistant and others were susceptible. Moderately resistant cultivars can be planted in nematode infested areas as alternative to susceptible cultivars.

Keywords: Cultivar; gerbera; root-knot nematode; susceptible.

1. INTRODUCTION

Gerbera (*Gerbera jamesonii* Hook) is one of the most important commercial cut flower belongs to the family Asteraceae. It is perennial in nature and popularly known as Transvaal daisy. According to the global trends in floriculture, gerbera occupies fourth position among cut flowers [1]. Among the various limiting factors in commercial cultivation of gerbera, the plant parasitic nematodes are presently considered as one of the most important one. Several plant parasitic nematodes are found to be associated with gerbera elsewhere in the world [2]. Out of several plant parasitic nematodes associated with gerbera cultivation, the root-knot nematodes are predominant one [3]. Root-knot nematode infested plant show characteristic symptoms viz., production of heavy root galling (Fig.1), general stunting and chlorosis of leaves(Fig.2).In India, yield losses due to root-knot nematode *Meloidogyne incognita* in gerbera was estimated to the tune of 31.1 per cent[4]. Host plant resistance is effective management tool that increases yield in spite of nematode population

densities that exceed the damage threshold [5]. Resistant germ plasm is considered to be eco-friendly, economically feasible and environmentally benign methods to combat root-knot nematode as compared to nematicides [6-8]. In integrated nematode management schedule resistant germplasm can also be integrate with other management practices. It has been found that root-knot nematodes may enter susceptible and resistant varieties of certain crops. Hence breaking of resistance in crop cultivars to root-knot nematodes may occur naturally or by selection containing one or more resistant genes [9]. Several research findings indicates that root-knot nematodes infecting gerbera can effectively managed by various methods [10,11] but very little information are available regarding screening of gerbera varieties against root-knot nematode.

Keeping these facts in view, the present investigation have been undertaken to find out the source of resistance through screening of gerbera cultivars in pot condition against root-knot nematode, *M. incognita*.



Fig. 1. Galling on roots of gerbera



Fig. 2. Chlorosis of leaves of gerbera due to Infestation of root-knot nematode

2. MATERIALS AND METHODS

A pot experiment was conducted in the nursery of Plantation Crop Garden, Biswanath College of Agriculture, AAU, Biswanath Chariali, Assam during *rabi* season 2023 to assess the reaction of some gerbera cultivars against root-knot nematode, *Meloidogyne incognita*. Suckers of six gerbera cultivars each of 3 to 5g were collected from the Horticultural orchard of Biswanath College of Agriculture. Plastic pots of 1000 cc capacity were filled with sterilized soil, sand and cow dung mixture in the ratio of 2:1:1. After filling of pots a single sucker of different gerbera cultivars were planted in each pot. The pots were arranged in completely randomized design with five replications for each variety. Fifteen days after planting plants were inoculated with freshly hatched second stage juveniles of *M. incognita* @ 1000J₂ per pot. Regular watering was done till the terminations of the experiment. Two months after inoculation plants were uprooted carefully

and roots system was properly washed under running tap water to remove the adhering soil particles in roots. Different observations *viz.* number of galls per root system, plant height, root length, fresh and dry weight of shoot and root were recorded. The varieties were categorized as highly resistant (HR), resistant(R), moderately resistant (MR), susceptible(S) and highly susceptible (HS) on the basis of number of galls per plant following 1-5 gall index scales furnish List 1 [12].

For estimation of population of *M. incognita*, soil from each pot was mixed thoroughly and 200cc sample from each pot was drawn and extracted by modified Cobbs' sieving and decanting technique. After extraction nematodes were counted in a counting dish using stereoscopic binocular microscope. Data were analyzed statistically using analysis of variance and Fisher's least significant difference (FLSD) was calculated for separation of mean.

List 1. Gall index (1 to 5 scales)

Scale	Particulars	Reaction
1.	No gall, no eggmass	Highly Resistant(HR)
2.	1-10 galls with eggmasses per plant	Resistant (R)
3.	11-30 galls with eggmasses per plant	Moderately Resistant(MR)
4.	31-100 galls with eggmasses per plant	Susceptible (S)
5.	Above 101 galls with eggmasses per plant	Highly Susceptible(HS)

3. RESULTS AND DISCUSSION

Data presented in Table1 showed that out of six cultivars screened against *M. incognita*, three cultivars viz. Pink Melody, Red Seven and Arka Krishika were found to be susceptible and other three cultivars viz. Saffron, Orange Sun Brust and Pride of Sikkim were found to be moderately resistant. Maximum numbers of galls were recorded in the susceptible cultivar Pink Melody (33.80) followed by Red Seven (32.80) and Arka Krishika (32.50) and minimum numbers of galls were recorded in the moderately resistant cultivar Orange Sun Brust (28.20). Similar trends of result were recorded in case of final nematode population in soil. Maximum final nematode population in soil was recorded in the susceptible cultivar Pink Melody (1450) followed by Red Seven (1366) and minimum was recorded in Orange Sun Brust (1262). This finding is in conformity with the findings made by Nayak et al. [13] (2018), who screened seven gerbera cultivars against *M. incognita* and recorded maximum number of galls and final nematode population in soil in the susceptible cultivar 'Seth' and minimum was recorded in the resistant cultivar 'Mammut. Similar findings were also

recorded by Manju and Subramanian [14] in screening trial of gerbera varieties against root-knot nematode.

Further, the analysis of growth parameters on plant height (cm), root length(cm), fresh and dry weight of shoot and root(g) were evaluated and the variety Orange Sun Brust which showed moderately resistance reaction had maximum plant growth parameters followed by other moderately resistance cultivars viz. Saffron and Pride of Sikkim (Table 2). Minimum plant growth parameters were recorded in the susceptible cultivar Pink Melody. This finding clearly indicates that number of galls in root system and final nematode population in soil had directly related with increase and decrease of plant growth parameters. Maximum number of galls per root system and final nematode population in soil was observed in the susceptible cultivar Pink Melody, which recorded minimum growth parameters. This may be due to that most of the cortex area of root system is occupied with the giant cells. Further, deformation and blockage of vascular tissue at feeding sites of nematode limit translocation of nutrients and water resulting in suppression of plant growth parameters.

Table1. Screening of gerbera cultivars against root-knot nematode, *M. incognita* (Mean of five replications)

Cultivars	Number of galls/plant	Root-knot index	Reaction	Final nematode population in soil* (200cc)
Saffron	28.80	3.00	Moderately resistant	1271 (35.665)
Arka Krishika	32.50	3.40	Susceptible	1351(36.769)
Pride of Sikkim	29.60	3.00	Moderately resistant	1279(35.777)
Red Seven	32.80	3.60	Susceptible	1366(36.973)
Pink Melody	33.80	3.60	Susceptible	1450(38.091)
Orange Sun Brust	28.20	3.00	Moderately resistant	1262(35.538)
SE(d)	1.822	0.203		0.128
CD(0.05)	3.828	0.427		0.269

*Figures in parentheses are square root transformed values

Table 2. Evaluation of gerbera cultivars against root-knot nematode, *M. incognita* (Mean of five replications)

Cultivars	Plant height (cm)	Root length (cm)	Fresh shoot wt.(g)	Dry shoot wt.(g)	Fresh root wt.(g)	Dry root wt.(g)
Saffron	28.8	22.10	16.20	2.82	15.80	2.75
Arka Krishika	26.6	19.10	13.20	2.76	13.00	2.62
Pride of Sikkim	27.4	19.50	13.40	2.88	13.20	2.76
Red Seven	25.6	17.00	12.40	2.64	12.80	2.30
Pink Melody	24.8	16.50	11.40	2.60	12.40	2.28
Orange Sun Brust	29.4	22.58	16.80	2.86	16.00	2.80
SE(d)	1.133	1.663	1.044		1.207	0.180
CD(0.05)	2.38	3.494	2.192	NS	2.535	0.378

The decrease of plant growth parameters is possibly due to improper uptake and transport of elements, nutrients and water resulted from maximum infestation with high population in soil.

Similar trends of results were also recorded by Mahanatheshwara and Nayak [15], who evaluated different cowpea cultivars against root-knot nematode, *M. incognita*.



Fig. 3. View of the experiment



Fig. 4. Galls on the roots of different gerbera cultivars

4. CONCLUSION

Results from the experiment it was found that no cultivars showed resistant reaction against root-knot nematode. Three cultivars viz. Orange Sun Brust, Saffron and Pride of Sikkim were found to be moderately resistant. In absence of resistant cultivars, these moderately resistant cultivars may be recommended for plantation in root-knot nematode infested areas.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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