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Screening of green gram germplasms against *Meloidogyne incognita*

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Abstract
Green gram germplasms were screened against root knot nematode, *Meloidogyne incognita*, in the net house under pot condition. Results of screening revealed that 15 lines of green gram were moderately resistant, while the remaining lines were found to be susceptible (80) and highly susceptible (15). No highly resistant and resistant cultivars were reported.

Keywords: Green gram, nematode, *Meloidogyne incognita*, screening

Introduction
Green gram is also known as Moong bean or Mung bean. Green gram is consumed as whole grains as well as dal in variety of ways in homes. It is an excellent source of high quality protein about 25% with easy digestibility. It fixes biological nitrogen ranging 30-74 kg / ha in the soil. It also provides plant residues @ 15-20 quintals per ha which can be used for making green manures. It is mainly cultivated in India, China and Southeast Asia. During 2017-18, In India, the total coverage area under mung bean was about 4.07 Mha with a production of 1.9Mton and the productivity was 467 kg/ha. More than 80 per cent of mung bean production comes from 10 states namely Rajasthan, Madhya Pradesh, Maharashtra, Bihar, Karnataka, Tamilnadu, Gujarat, Andhra Pradesh, Odisha and Telangana. In Orissa, the total area coverage and production of mung bean during 2017-18 was 0.22 Mha (which is 5.42% of total mung bean cultivated area in India) and 0.08 Mton (which is 4.22% of total mung bean production in India) respectively [5]. However, its production is greatly affected by various plant parasitic nematodes. The major damage is caused by root knot nematode (*Meloidogyne incognita)*, with 29-31% yield loss to green gram in India [1, 4]. Considering the crop loss caused by root knot nematode, various management strategies have been taken up and one of them is the use of resistant variety which is given top priority as an eco-friendly and economic venture.. Host plant resistance has emerged as an economical and effective management tool that improves crop yield in the presence of nematode population densities that exceed the damage threshold [2,6].Therefore, an attempt was made to screen a few green gram germplasms against *M. incognita* in Odisha.

Materials and methods
A total of 110 green gram germplasms were screened as pot culture in the net house of Dept. of Nematology, College of Agriculture, OUAT, Bhubaneswar, Odisha. Seeds were surface sterilized with 2.5% sodium hypochlorite solution for 2 minutes, washed thoroughly with sterile water and air dried. These surface sterilized seeds were sown @ 4 seeds in each surface sterilized 15cm diameter earthen pots containing 1kg steam sterilized soil mixture. Each germplasm was replicated twice in Complete Randomized Design. At 10 days after sowing, thinning was done keeping one seedling per pot. After two weeks of sowing, $1000J_2$ of root knot nematode (*M. incognita*) were inoculated near the base of the plants of each pot. Watering was done just to drench the soil avoiding over flooding. At sixty days after inoculation, plant in each pot was harvested and immersed in water to dislodge the adhering soil so that whole of root system was obtained by this method. The number of root galls in each variety was estimated and recorded. Based on the number of root gall present in the affected roots, each germplasm was categorized in 5 scales as 1-5 root gall index [8] which is cited below.

Table 1: Rating scale for the assessment of level of resistance of plant cultivars against root knot nematodes, based on number of galls (Sasser and Taylor, 1978).

Root knot Index	No. of galls/root system	Resistance rating
1	0	Highly Resistant (HR)
2	1-10	Resistant (R)
3	11-30	Moderately Resistant (MR)
4	31-100	Susceptible (S)
5	>100	Highly Susceptible (HS)

Results and discussion

Table 2: Reaction of different green gram germplasms to *Meloidogyne incognita.*

Reaction	Name of Green gram germplasm
Highly resistance (HR)	-
Resistant (R)	-
Moderately Resistant (MR)	Kalahandi Local, Kendrapada Local, Bhawanipatna LOCAL, OUM-11-5, NM-94, NM-92, OUM-62, MG-12, HUM-10, PS-10, OBGG-52, ADT 3,CO 6, ANM 11-12, Kopergaon = 15nos.
Susceptible (S)	Makarjhola Local, Ambagaon Local, KEONJHAR Local, Jharsuguda Local, V2-22, IPM-02-3, ML-1666, PAU-911, KPS-1, IPM-02-17, KPS-2, ML-1299, PDM-139, LGG-460, EC-693376, EC-693358, Dhauli, Hum-12, COGG-902, LGG-407, COGG-912, HUM-1, M-9-2, KM-9309, KM-851, Hum-6, ML-555, AKM-8802, Visal Mart, PUSA-9971, PUSA-972, PUSA-105, SML-668, PUSA-9672, RCM-14, TM-98-50, Nayagarh Local, Pant M-2, COGG 13-19, PKV-AKM-4, HUM -16, MH 2-15, SML 832, PUSA 1741, COGG 13-14, PUSA 1702, OBGG-173, IPM 205-7, SML -1822, K-851, PUSA 1731, PANT M 11-9, VGG 15-030, PUSA 9072, SML 1820, SML 1741, VGG 15-029, PUSA 9531, PUSA-1371, LGG 450, PUSA 1701, RG -268, PUSA1641, OBGG 56, OBGG 57, COGG 13-39, TARM 1, PUSA 9972, TMB 136, TMB 131, CO 8, TU 44, TMB 37, SVM 6222, TMB 199, TYPE 44, MGG 385, MGG 387, AGG 35, ML -267 = 80nos.
Highly Susceptible (HS)	IPM-02-14, ML-818, OUM-99-3, TM-98-15, Jagatsinghpur LOCAL, Pant-Mung-5, TM-96-2, PUSA-0672, OBGG-176, BM-4, Pusa Ratna, OBGG-180, Pant M-4, ADGG 13018, ADGG 13009 = 15nos.

Table: 2 indicated that of 110 green gram germplasms, no germplasm was found highly resistant and resistant against *Meloidogyne incognita*, although, 15 germplasms were moderately resistant, 80 susceptible and 15 highly susceptible to *M. incognita*. This finding was in conformity with the results of Devi *et al.* (2014) [3] who evaluated twenty eight germplasms of mungbean from AICRP (MULLaRP), HPR, Islanpur to test against *Meloidogyne incognita*, under green house condition. Of twenty eight genotypes, 24 were susceptible and 4 were highly susceptible to *Meloidogyne incognita*. No resistant and moderately resistant genotypes were recorded. Moreover, the result corroborated with finding of Singh and Prasad (2016) [7] who made an attempt to screen 50 mungbean lines/germplasms received from IARI against *Meloidogyne incognita.* It was found that out of 50 different mungbean lines/germplasm, none were highly resistant and resistant to root knot nematodes, but 5 lines exhibited moderately resistant reaction, while 44 germplasms were found to be susceptible and 1 highly susceptible. The results revealed considerable variation in response to *M. incognita* among the different germplasms of green gram screened. Such variability in tolerance to the root knot nematode might be influenced by host plant genetics and other environmental factors. Presence of nematode resistance genes makes the plant root less attractive for attacking nematodes. Resistance and susceptibility to plant parasitic nematodes reflect the effect of the plant on the nematode's ability to reproduce [6]. Thus, the use of resistant germplasm can be a vital component for the management of root knot nematode population in pulse ecosystem.

Conclusion

The result of the experiment concluded that out of 110 green gram germplasms, no germplasm was found highly resistant and resistant against *Meloidogyne incognita.* But 15 germplasms were found moderately resistant, 80 susceptible and 15 highly susceptible to *M. incognita.*

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