Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue [2] 2017: 157-160

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804
NAAS Rating 4.95

FULL LENGTH ARTICLE **OPEN ACCESS**

Study On Relative Preferences Of Foliar Nematode, *Aphelenchoides Besseyi* Christie Between Rice And Tuberose On Silicon Analysis.

Nagulapalli Sneha latha*, Nagamandla Ramya Sri and Mrunalini chowdhary
Bidhan Chandra krishi viswavidhyalaya, Faculty of agriculture, Mohanpur, Nadia, West Bengal, 741252, India.
*Corresponding author
Email.Id: Snehagoudsneha306@gmail.com

ABSTRACT

From early 90s we have been observing that Aphelenchoides besseyi also, to affect tuberose badly in west bengal as well as in other tuberose growing adjacent states. Interestingly, in most of the cases where tuberose is grown side by side or in sequence with rice, manifestation of symptoms is seen only in tuberose but not in rice. This made us curious to search the reasons behind, comparative preference of nematodes towards tuberose. We decided to go for silicon analysis of both the plants. The experiment was carried out in the field from 2016 - 2017 at Central research farm of B.C.KV, Gayeshpur and Laboratory experiment done at college of agriculture at B.C.K.V. Results of this experiment showed that, total silicon content was found to be higher in rice than tuberose,Silicon helps to strengthen cells of rice leaf, stem, and roots. Silicon confers resistance to herbivores via physical and biochemical.Therefore, differential contents of these facet could have been a strong reason behind the inclination of preference to tuberose by the foliar nematodes.
Key words:Aphelenchoides besseyi,foliar nematodes, comparative preference, Silicon.

Received 21.07.2017 Revised 02.08.2017 Accepted 27.08.2017

INTRODUCTION

Among the ornamental bulbous plants, "Tuberose" popularly known as "Rajanigandha" which is valued much by the aesthetic world for beauty and fragrance of their flowers, elegance and sweet pleasant for cut-flower trade and essential oil industry. Tuberose is a quite hardy plant, although many pests were recorded feeding in these flower crops.Among these pests, one of the most important pest was recorded as *Aphelenchoides besseyi* (Foliar nematode). The foliar nematode, *Aphelenchoides besseyi* was first time reported from leaves of tuberose in the Hawaii Island by Holtzmann (1968) known to cause 'Floral malady'.Market value of flower is highly reduced due to reduction of fragrance and change the colour of flower.It has been also identified as the key pest and is posing a serious threat to the Rice which is essential for our day to day life and serves as the most important food source for Asian countries where it is an economic crop for farmers and workers who grow it on millions of hectares throughout the region.Dastur (1936) first time reported*Aphelenchoides besseyi* Christie on rice.This nematode known to cause 'white tip' diseases of rice. Interestingly, in most of the cases where tuberose is grown side by side of rice or in sequence with rice, manifestation of symptoms is seen only in tuberose but not in rice. Here, the nematodes either do not attack rice to that extent which could lead to symptom manifestation or if the tiny organisms are recovered from the rice seeds, the plants remain without apparent infestation. This made us curious to search the reasons behind this comparative preference of the nematodes towards tuberose. We decided to go for silicon analysis of both the plants so that the nematodes' preference or non preference could be clarified. The mechanism of action of Si seems to be physical as well as physiological. Accumulation of Si in the plant tissues results in their hardening, preventing insects and fungi from penetrating cells (Kim et al., 2002; Kvedaras & Keeping, 2007). It has also been demonstrated that Si enhances the production of flavonoid compounds, phenols and several defensive enzymes, all implicated in plant disease resistance (Cherif et al., 1992; Liang et al., 2005). This dual mechanism complicates invasion by organisms, which need first to puncture the cell wall prior to feeding. Even though plant-parasitic nematodes are included in this category, very few studies on the use of Si against nematodes have been published. One such study conducted by Swain and Prasad (1998) showed that the Si content was higher in two out of three rice varieties resistant to Meloidogyne graminicola and that the level of silica increased with plant age in resistant, but not in susceptible rice roots. Silva et al. (2010) found that supplying coffee plants with Si increased root resistance to M. exigua by decreasing its reproductive capacity.

MATERIAL AND METHODS:

The experiment was carried out from 2016 - 2017 at Central research farm of Bidhan Chandra Krishi Viswavidyalaya, Gayeshpur, Nadia, West Bengal.Laboratory experiment for silica estimation was done at Bidhan Chandra Krishi Viswavidyalaya,Mohanpur.

Collection of the flower sample for nematode innoculation in rice plants. Nematode infestedflower samples of calcutta double of tuberose were collected randomly from fixed plots and brought to the laboratory for extraction of nematodes by the Cobbs Sieving and decanting method and modified Baermann funnel technique (Southey, 1970).Estimation of nematode in samples and counting of population of the nematodewere done. From thoroughly stirred suspension, 2ml was drawn with the help of pippete and taken on counting disc for counting the nematodes under stereoscopic binocular microscope. Then average number of nematode for 2ml of suspension was determined.

Planting of Semi-dwarf ricevariety Satabdi (IET-4786).Tuberose varieties of (Calcutta double and Calcutta single) Bulbs infested with nematode were presoaked overnight and planting was done.After initiation of rice flower, nematode inoculation were done (2ml/plant) with the help of syringe in between the leaf and the flower initiated, at 10 days interval for 3 times.During the programme, tuberose and rice plants were examined thoroughly to see any changes in colour, texture, characteristics of the leaves, floral scape,flower of tuberose and seed, leaf and culm of rice.After the examinations the infected tuberose plant parts (scape and flowers) and rice (seed and culm) were collected randomly for the further examination like Changes in silica levels were estimated by the Hessey method. Statistical significance of the means was analyzed by ANOVA.

Result and discussion:

Plant- nematode interactions could be interpreted based on biochemical analysis of either one or both the interacting organisms. Many biochemical factors like protein, sugars,phenols, silicon etc are known to be associated with biotic resistance in crop plants and it is obvious that the biochemical factors are more important than morphological and physiological factors in conferring non preference and antibiosis (Prabhu*et al.,* 2008).

The population of foliar nematodes in flowers of calcutta double variety of tuberose was found to be approximately 5,152/20gm whereas that in the flowers of calcutta single variety found to be approximately 600 nematodes/20gm.The population of foliar nematodes recovered from the seeds of rice variety Satabdi(IET-4786) was 90/10g of seeds.

(c) Plant silica Profile:

Silicon has generally not been considered essential for plant growth, although it is well recognized that many plants, particularly Poaceae, have substantial plant tissue concentrations of this element. Recently, however, the International Plant Nutrition Institute IPNI (2015), Georgia, USA has listed it as a "beneficial substance". Numerous studies have now established that silicon may alleviate both biotic and abiotic stress. Silicon confers resistance to herbivores via two described mechanisms: physical and biochemical/molecular. The reported relationships between soluble silicon and the jasmonic acid (JA) defense pathway, and JA and herbivore-induced plant volatiles (HIPVs) suggest that soluble silicon may enhance the production of HIPVs. Further, it is feasible that silicon uptake may affect protein expression (or modify proteins structurally) so that they can produce additional, or modify, the HIPV profile of plants. Rice exhibits the greatest uptake of silicic acid in the grass family. Silicon helps to strengthen cells of rice leaf, stem, and roots. Epidermal cells accumulate the most amount of silicon absorbed from the soil. Evaluation of preference/non preference of the foliar nematodes towards tuberose and rice on the basis of silica content was made randomly selected rice culms, seeds, tuberose stalks and flowers, irrespective of their ages in 2016-2017. The experimental findings revealed that the total silica content in uninfected rice seeds was higher (4.06%) than that of healthy tuberoseflowers (1.06%)and was highest in infected seeds of rice (5.3%) (Table no. 2 and Fig no. 3).Silicon is deposited in the form of silica gel or biogenetic opal as amorphous $sio_{2}.nH_{2}0$ in cell walls and intercellular spaces of root and leaf cells as well as in bracts. Silicon also can be found in the form of monosilicic acid, colloidal silicic acid, or organo silicon compounds in plant tissues. Therefore, differential silicon contents also could have been a strong reason behind the inclination of preference to the tuberose by the foliar nematodes.

Table no.1 Total silica content in tuberose and rice plant parts during 2016-2017.

Treatments	% Silica	Treatments	% Silica	Treatments	% Silica	Treatments	% silica
TUF	1.06	TIF	1.16	TIST	1.06	TUIST	1.23
RUISE	4.06	RISE	5.33	RICU	8.3	RUICU	6.23
Sem±	0.289	Sem±	0.319	Sem±	0.359	Sem±	0.180
$F_{(calculated)}$	54.0	$F_{(calculated)}$	85.150	$F_{(calculated)}$	203.408	$F_{(calculated)}$	384.615
$F_{(tabulated)}$	21.198	$F_{(tabulated)}$	21.198	$F_{(tabulated)}$	21.198	$F_{(tabulated)}$	21.198

TUF-Tuberose uninfected flower
RUISE-Rice uninfected seed
TIF-Tuberose infected flower
RISE-Rice infected seed
TUIST-Tuberose uninfected stalk
RUICU- Rice uninfected culm
TIST - Tuberose infected stalk
RICU-Rice infected culm

Figure no.1 Percentage Changes in silica Content in uninfected and infected plants of tuberose(flower) and rice(seed).

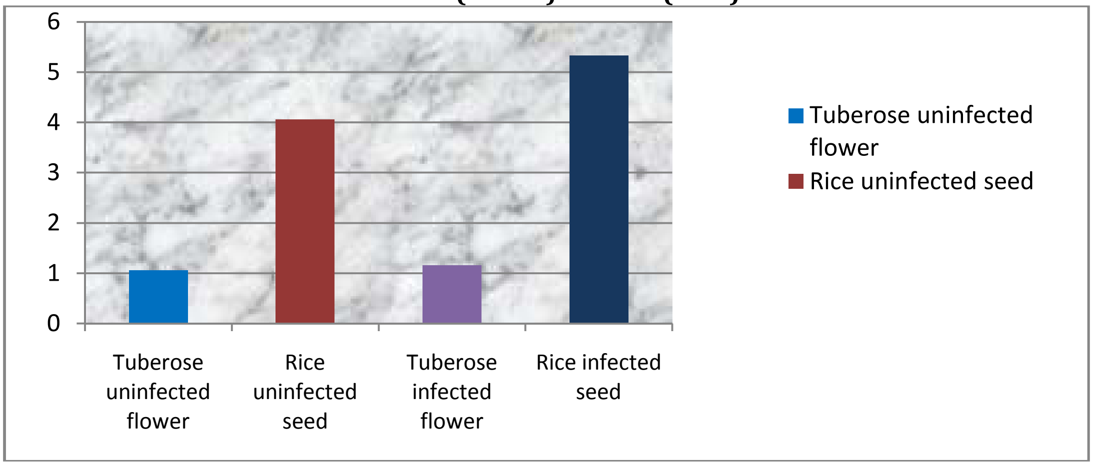
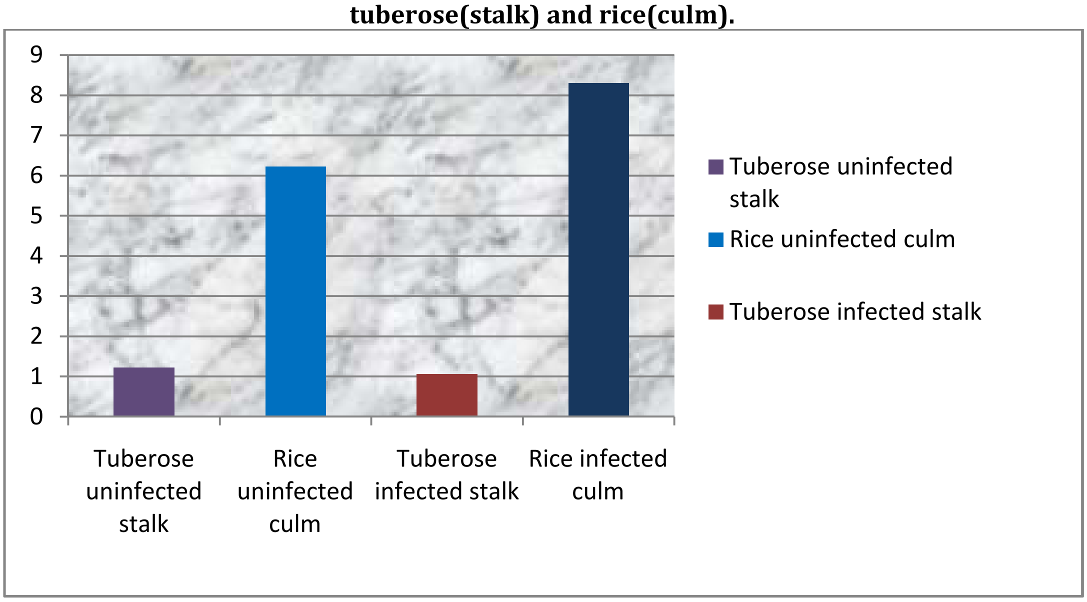


Figure no.2 Percentage Changes in silica Content in uninfected and infected plants of tuberose(stalk) and rice(culm).



REFERENCES

1. Cherif, M., Benhamou, N., Menzies, J.G. & Belanger, R. R. (1992). Silicon induced resistance in cucumber plants against Pythium ultimum. *Physiol. Mol. Plant Path.***41**: 411-425.
2. Dastur, J.F. (1936). A nematode disease of rice in the central proviness. *Proceeding of the Indian Academy of Sciences*. **4**: 108 - 122.
3. Holtzman, O.V. (1968). A foliar disease of tuberose causer by *Aphelenehoides beseyi. Plant Dis. Reptr.* 52 : 56.

4. Kim, S. G., Kim, K. W., Park, E. W. & Choi, D. (2002). Silicon induced cell wall fortification of rice leaves: a possible cellular mechanism of enhanced host resistance to blast. *Phytopath*. **92**: 1095-1103.
5. Kvedaras, O.L. & Keeping, M. G. (2007). Silicon impedes stalk penetration by the borer Eldana saccharina in sugarcane. *Entomol. Experi. et Appli*. **125**: 103-110.
6. Liang, Y.C., Sun, W.C., Si, J. & Romheld, V. (2005). Effects of foliar and root-applied silicon on the enhancement of induced resistance to powdery mildew in Cucumis sativus*. Plant Pathol*. **4**: 678-685.
7. Prabhu, M., Ramesh A. K. and Ponnuswami, V. (2008). Breeding for shoot and fruit borer resistance in brinjal*. Asian J. Hort*., **3**(2): 456- 459.
8. Silva, R.V., Oliveira R. D. L., Nascimento K. J. T. & Rodrigues F. A., 2010. Biochemical responses of coffee resistance against Meloidogyne exigua mediated by silicon. *Plant Path*. **59**: 586-593.
9. Southey, J.F. (1970). Laboratory methods for work with plant and soil nematodes.*Technical Bulletin 2,Mins. Agr. Fish food. HMSO,London.*
10. Swain, B.N. & Prasad, J.S. (1998). Influence of silica content in roots of rice varieties on the resistance to rootknot nematode. *Indian J. /ematol*. **18**: 360-361.

CITATION OF THIS ARTICLE

Nagulapalli Sneha latha, Nagamandla Ramya Sri and Mrunalini chowdhary. Study On Relative Preferences Of Foliar Nematode, *Aphelenchoides Besseyi* Christie Between Rice And Tuberose On Silicon Analysis.. Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue 2, 2017: 157-160