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SCREENING OF WILD *SOLANUM* SPECIES AS A ROOTSTOCK AGAINST DRY ROOT ROT DISEASE, *Macrophomina phaseolina* IN BRINJAL UNDER CHANGING ENVIRONMENT

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Abstract: *The emerging scenario of climate change, erratic rainfall and deviation in temperature is causing unpredictable changes in moisture which are predisposing the vegetable crops to diseases, not known earlier or minor in nature. Recently much drastic change in climate has led to outbreak of many diseases, among which is more danderous under drought condition is dry root rot of brinjal caused by Macrophomina phaseolina is nowadays becoming a major threat. In this study five wild species of Solanum viz., S. torvum, S. viarum, S. xanthocarpum, S. incanum and S. elaegnifolium along with CO 2 as check were screened against dry root rot disease under open field and artificially inoculated glass house condition at different days interval of 30th, 45th and 60th days after planting (DAP). Among the wild species screened, there was no incidence of disease was observed in S. torvum at different days intervals. The biochemical traits which impart resistance to root rot pathogen viz., phenols, ortho-dihyroxy phenols, protien and ascorbic acid were highest in S. torvum roots. The active defence enzymes such as peroxidase (PO), polyphenol oxidase (PPO) and phenylalanine ammonia lyase (PAL) also higher in roots of S torvum. Similarly twenty graft combinations with wild Solanum species were also screened against M. phaseolina revealed that the graft combination with S. torvum (S. torvum+ Hybrid Derivative (HD) 1, HD2, HD3 and COBH 2) doesn't show any symptom development at 30, 45 and 60th DAP. Based on the per cent disease incidence, S. torvum was screened and graded as 'Resistant' against M. phaseolina and can be recommended as a best rootstock for brinjal grafting under varying climatic conditions.*

Key words: *Brinjal, wild Solanum species, grafting, dry root rot.*

Introduction: Brinjal is one of the most popular vegetable crops grown throughout the year all over the country, except in high altitudes. In India, next to potato and tomato, brinjal occupies third position among the vegetables. Even though it is cultivated in larger area the productivity is low due to major biotic stresses *viz*., pest, disease and nematodes. Adverse climatic conditions are primarily responsible for the low productivity of brinjal. Due to unfavourable climatic conditions and incidence of pest and diseases quality produce is the main contrast in reaping higher returns especially during summer production. Recently much drastic change in climate especially water scarcity otherwise known as drought has led to outbreak of new disease; dry root rot of brinjal caused by *M. phaseolina* is nowadays becoming major threat under dry climatic condition.

Materials and Methods

This investigation were carried out at the field research unit and glass house condition of College Orchard, Horticulture College and Research Institute, Tamil Nadu Agricultural University, Coimbatore to screen the wild *Solanum* species against dry root rot pathogen. The experiment was laid out in Randomized and Completely Randomized Block Design (RBD, CRD) with three replications. The five wild *Solanum* species *viz*., *Solanum torvum, S. viarum, S. xanthocarpum, S. incanum,* and *S. elaegnifolium* along with susceptible check CO_2 were artificially inoculated with the sand maize medium *M. phaseolina* cultures @ 100g per pot at 15 DAP. The plants were observed for the wilting symptoms at different day's intervals 30, 45 and 60th DAP along with the biochemical traits (Phenols, OD phenols, protein, and

ascorbic acid and defence enzymes such as peroxidase (PO), poly phenol oxydase (PPO) and phenylalanine ammonia lyase (PAL) which were also analyzed in laboratory.

Results and Discussion

The result revealed that the wild *Solanum* species along with check plants screened at different days of interval *viz*., 30, 45 and 60th DAP indicated that the highest dry root rot incidence was noticed in the species *S. viarum* (68.49 %) followed by *S. elaegnifolium* (66.62 %) The species *S. torvum* did not exhibit any dry root rot symptom (0) and it was very high in susceptible check CO_2 (74.13 %) both under field and glass house condition (Table 1& 2). The wild species *S. torvum* could be considered as "highly resistant" species for *M. phaseolina*. As the *Solanum torvum* has good root architecture with more number of lateral roots, it could survive under dry condition and overcome the pathogen infection.

Table 1. Dry root rot incidence on wild *Solanum* species under pot culture condition

Rootstock	Root rot incidence (%)		
	30* DAP	45* DAP	60* DAP
Solanum torvum	0	0	0
Solanum viarum	64.20 (53.26)	76.90 (61.30)	86.47 (68.49)
Solanum xanthocarpum	42.80 (40.86)	68.50 (55.87)	73.19 (58.83)
Solanum incanum	38.60 (38.41)	52.70 (46.54)	63.87 (53.06)
Solanum elaegnifolium	50.40 (45.23)	70.30 (56.99)	84.18 (66.62)
CO_2	78.50 (62.41)	89.20 (70.94)	92.29 (74.13)

** Mean of five replications*

Figures in parentheses are arc sine transformed values

Table 2. Dry root rot incidence on wild *Solanum* species under field condition

Rootstock	Root rot incidence (%)		
	30* DAP	45* DAP	60* DAP
Solanum torvum	00	0	0
Solanum viarum	32.60 (34.82)	50.48 (45.28)	72.98 (58.69)
Solanum xanthocarpum	25.10 (30.06)	40.56 (39.56)	52.93 (46.68)
Solanum incanum	18.29 (25.32)	28.16 (32.05)	43.37 (41.19)
Solanum elaegnifolium	30.42 (33.47)	48.25 (43.99)	68.90 (56.12)
CO_2	40.50 (39.52)	62.34 (52.15)	83.74 (66.28)

** Mean of five replications*

Figures in parentheses are arc sine transformed values

Table 3. Biochemical constituents in roots of wild *Solanum* species inoculated with *Macrophomina phaseolina* (21 days after inoculation)

Treatment	Phenols (mg g^{-1})	OD phenols (mg g^{-1})	PO	PPO	PAL
S. torvum	50.25	22.54	3.88	3.65	43.86
S. viarum	16.48	12.54	1.60	1.48	13.69
S. xanthocarpum	25.46	15.45	2.56	2.87	20.02
S. incanum	30.50	19.20	2.93	2.99	36.25
S. elaegnifolium	18.41	13.62	2.49	2.24	26.25
CO_2	15.40	5.24	1.08	1.38	14.29

PO *- Peroxidase (changes in OD min^{-1}g^{-1} of sample)*

PPO *- Polyphenol oxidase (changes in OD min^{-1}g^{-1} of sample)*

PAL *- Phenylalanine ammonia lyase (nmol of trans cinnmic acid min^{-1} g^{-1} of fresh tissue*

The mechanism of controlling the interaction between the fungus and host plants involved in the production of fungus cell wall degrading enzymes [1]. The rootstock with higher amount of lignified cells in the roots, more number of functional roots and production of fungal cell degrading chemicals and enzymes also imparts resistance to the dry root rot pathogen.

The biochemical mechanism *viz*., phenol, OD phenol, protein, peroxidase, polyphenol oxidase and phenyalanine ammonia lyase was analyzed in the wild *Solanum* roots which was artificially inoculated with *Macrophomina* culture at different days of inoculation. The results revealed that among the five wild *Solanum* species, *S. torvum* roots recorded highest value for all the biochemical traits at different days interval (Table.3). The traits phenol, ortho-dihydroxy phenol, peroxidase, polyphenol oxidase, phenyl alanine ammonia lyase accumulated more at 21 days after inoculation and then gradually decreased revealed that three weeks after inoculation was more favourable for pathogen attack.

The investigation result revealed that the species *S. torvum* with high or moderate levels of these biochemical constituents suffered less for root rot pathogen and these biochemical constituents are responsible for conferring

resistance to root rot pathogen. The resistant mechanism which involved in the production of phytoalexins and that might have resulted in inhibit of organism multiplication and proliferation inside the host.

Accumulation of these biochemical traits has been correlated with induced systematic resistance in several plants [2-5].

Conclusion

From this study it is concluded that the inoculation of wild *Solanum* species with *Macrophomina phaseolina* on 30, 45 and 60 DAP showed that *S. torvum* exhibited no symptom and manifested as resistant for dry root rot under both pot culture and field conditions similarly the grafts inoculated with *M. phaseolina* indicated that four scions with *S. torvum* as rootstock did not exhibit any symptom of root rot under pot culture and field conditions. Based on disease incidence value, *S. torvum* was adjudged as the best species to impart disease resistance against dry root rot.

The biochemical constituents in wild *Solanum* species after the inoculation of *M. phaseolina* showed that higher phenol, ortho-dihyroxy phenol content and enzymes *viz*., peroxidase, polyphenol oxidase, phenylalanine ammonia lyase were observed with wild species *S. torvum* at 21 DAI under both pot and field conditions also the biochemical analysis with respect to grafts against dry root rot pathogen under pot culture condition also shows highest readings for all chemicals and enzymes with COBH 2 on *S. torvum*.

Hence, it was confirmed from the study that the wild species *Solanum torvum* could be strongly recommended as the best rootstock for eggplant propagation and production under dry climatic conditions.

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