Epitome : International Journal of Multidisciplinary Research
ISSN : 2395-6968

Studies on Sensitivity of Different Types of Sugars on Metalaxyl Resistant Strain of *Phytopthora drechsleri sp.cajani.*



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ABSTRACT

Resistance in a pathogen population becomes important when the frequency of resistant strains builds up to dominate the otherwise sensitive population. The built up of resistant strains is caused by the frequent use of the site-specific fungicide which exerts a selection pressure on the population (Thind, 2008). Fungal pathogens resistant to a particular fungicide may vary in pathogenicity and fitness (ability to compete and survive in nature). Fungicides are an important tool for managing fungal crop diseases, which is a major production problem in many areas of world. Application of fungicides is presently the principle practice in most crops for managing diseases. These fungicides generally have a high risk of developing resistance because they have specific modes of action (McGrath, 2001). The fungicide such as Metalaxyl was recommended against Phytopthora blight of pigeon pea. It was a commonly used fungicide against tur blight in several parts of India.In the recent years the sensitivity of Phytopthora drechsleri sp,cajani has be decreased towards Metalaxyl. Metalaxyl is a systemic fungicide a very minute concentration was enough to manage pigeon pea stem blight disease caused by Phytopthora drechsleri sp,cajani To

manage the metalaxyl resistant strains of Phytopthora drechsleri sp,cajani,we have isolated the Phytopthora from infected stem of tur. This indicates that the sugar is an essential ingredient required for growth and development of pathogenic fungi. If we develop sugar free varieties of tur (cajanus cajan) it is possible to avoid infection of phytopthora drechsleri and we can avoid losses caused by the blight disease.

Keywords: Phytopthora drechsleri sp,cajani, Fungicide and Metalaxyl

RESEARCH PAPER

Introduction :

Pigeonpea [*Cajanus cajan* (L.) Millsp.], is the fourth most important food legume in the world . In India, Pigeonpea is the second most important food legume crop after chickpea. It provides a high quality diet for human consumption as a main source of protein, especially for vegetarian population of the Indian subcontinent. It is grown under a wide range of cropping systems in the Deccan Plateau (DP) in India (Reddy *et al*. 1998). Globally, Pigeonpea is cultivated over about 5.32 million ha, adding 4.24 million tonnes of grain to the global food basket (Factfish, 2012). In India, it is cultivated over 3.89 million ha, accounting 3.02 million tonnes of grain and in Andhra Pradesh it is cultivated in about 0.48 million ha, with 0.25 million tonnes of grain (Indiastat, 2013). The source of sugar is very important ingredient required for growth of pathogenic as well as non-pathogenic fungi.It is one of the essential ingredient of nutrition of fungal flora .Phytopthora drechsleri sp,cajani is a soil borne pathogen which is responsible for huge losses of tur (Pigeon) by causing stem blight disease first reported by Williams etal.1968 and Pandey etal 2006 reported 14.67% losses of pigeon pea due to infection of Phytopthora drechsleri sp,cajani. (Kannaiyan *et al*. 1984; Kannaiyan *et al*. 1980; Willams *et al*. 1975). Pal *et al*. (1970) estimated yield losses up to 98 per cent as the affected plants dry up rapidlyThe infected plants possess a gall like abnormal swelling knot above the soil surface. The blighted stems are easily be identified.It has observed that the water loged areas were more favourable for the growth and development of the disease. For the management of Phytopthora blight disease of pigeon pea several systemic fungicide has been used through out the world .The fungicide such as Metalaxyl was recommended against Phytopthora blight of pigeon pea. It was a commonly used fungicide against tur blight in several parts of India.In the recent years the sensitivity of Phytopthora drechsleri sp,cajani has be decreased towards

Metalaxyl. Metalaxyl is a systemic fungicide a very minute concentration was enough to manage pigeon pea stem blight disease caused by Phytopthora drechsleri sp,cajani . Arora *et al.* (1992) found that there was metalaxyl resistance in *Phytophthora infestans* causing late blight of potato at Nilgiri hills of Southern India. Thind *et al.* (2001) also found 10 metalaxyl resistance in *Phytophthora infestans* in Punjab. Kumar *et al.* (2007) observed that isolates of *Colletotrichum gloeosporioides* causing mango anthracnose were resistant to copper oxychloride. Mathews *et al.* (2009) noticed Mancozeb resistance in *Colletotrichum gloeosporioides*.To manage the metalaxyl resistant strains of Phytopthora drechsleri sp,cajani,we have isolated the Phytopthora from infected stem of tur. The isolated strains from different parts of Marathwada were named as A_1.B_1,P_1P_2.The isolate A1 was obtained frm fields of Aurangabad region of Marathwada ,B1 isolate was isolated from research centre of crop plant from Badnapur and isolate P1P2 was obtained from International crop Research in Semi Arid Tropics Patancheru Hyderabad.All the isolates maintained on PSMA(Pigeon pea seed meal Agar) for further studies .The resistant strains of each isolate was developed artificially in the laboratory. In this investigation,sensitivity of Metalaxyl sensitive and resistant strains to different types of sugar source has been studied.

Material and Methods:

Isolation of Pathogen:

The infected blighted tur stems were brought to the laboratory in sterile polythene bags ,a separate bags was used for each sample.The infected portion of stem was surface sterilized by 0.01% $Hgcl_2$ solution and a small piece of stem was inoculated on PDA amended petriplate and incubated at room temperature 22+-1^{o}c.The pathogen was recultured on newly prepared by PDA containing petriplate by single hyphal thread method for purification of culture .The process is repeated. The pathogen was confirmed on the basis of morphological aspects of fungal hyphael ,type of sporangia ,size of mycelium and type of hyphae.

Pathogenicity Test:

The hybrid HY-3C seeds of pigeon pea were selected for study because of its more susceptibility towards stem blight disease .About 20 seeds were sown in earthen pots at equal distance containing sterile soil. The soil was sterilized in Autoclave at 15lb pressure for 20 minutes. The pots were poured with 5ml of hyphal suspension of Phytopthora drechsleri prepared in sterile water. The plants were covered with wet polythene bags to maintain low temperature .The 22days old

plants of pigeon pea shows infection.The symptoms were compared with the symptoms of parental plants.The pathogenecity test was confirmed by method Koch's postulates.

Isolation of resistant strains of isolates A_1 and P_1:

The vigourously growing 4 to 6 days old mycelium on PDA amended flask was treated with 0.001% EMS(Ethyl Methyl Sulphonate) for 10 minutes. Then the treated suspension was spread on PDA containing plate in sterile condition. The plates were incubated at room temperature. Three plates were inoculated for each treatment. The colonies of EMS treated fungus were morphologically different than the untreated fungal colonies .The colony of EMS treated Phytopthora drechsleri were more compact and thicker. The EMS treated colony was isolated on PDA containing plate and allowed to grow.

Test for resistance towards Metalaxyl :

The 4mm disc of margin of 6 days old colony of treated and untreated fungus was removed by 4mm sterile borer and inoculated on metalaxyl amended PDA petriplate in triplicate.The growth of sensitive strain of A1 and P1 was completely inhibited at 500ppm metalaxyl.The EMS treated strains of P1 and A1 shown normal growth on metalaxyl 500 ppm containing petriplate.The EMS treated A1 was inhibited for some extent in comparison to P1 strain of phytopthora treated by EMS.The resistant strains to metalaxyl were isolated separately for further studies to see the effect of different types of sugars an sensitive and resistant strains.

Effect of Different Types of Sugars on Sensitive And Resistant Strain

Sr,no	Types of sugars	Strain	Dry weight of mycelium(mg)	
			Sensitive strain	Resistant strain
1	Glucose	A_1	160	185
		P_1	132	180
2	Fructose	A_1	154	180
		P_1	135	147
3	Mannose	A_1	144	172
		P_1	137	158
4	Galactose	A_1	153	155
		P_1	148	151
5	Sucrose	A_1	160	180

		P_1	110	125
6	D-xylose	A_1	91 37	95
		P_1		35
7	Mannitol	A_1	17	20
		P_1	20	22
8	Lactose	A_1	15	17
		P_1	14	16
9	Arabinose	A_1	10	21
		P_1	12	20
10	Control	C	20	24

Result And Discussion:

The table clearly indicates that the fungi require adequate source of sugar for their growth and development .Different types of sugars used to observe response of sensitive as well as metalaxyl resistant strain of phytopthora. Among 10 types of sources of sugars only Glucose is found more favourable for growth of meaty sensitive as well as resistant strains of Aurangabad (A1) and Patancheru (P1).The pathogenic fungi are host specific as well as nutrition specific. The sugars like D-xylose.Mannitol ,Lactose and Arabinose restricted the growth of meaty sensitive as well as resistant strain of phytopthora dreschsleri f.sp cajani.The Results Obtained Clearly Indicates That The Meaty Resistant Strains Is Grown More Vigorously In presence of all types of sugars used during study. But the least growth in D-xylose, mannitol ,lactose and Arabinose. The control petriplates were amended with PDA but no sugars. The petriplate containing no sugar was shown very poor growth of metayxl sensitive as well as resistant strain of phytopthora drechsleri. This indicates that the sugar is an essential ingredient required for growth and development of pathogenic fungi. If we develop sugar free varieties of tur (cajanus cajan) it is possible to avoid infection of phytopthora drechsleri and we can avoid losses caused by the blight disease.

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