PUBLISHED ON 29TH FEB 2012

STUDY OF ZONE PRODUCING ANTAGONISTIC BACTERIA FROM SOIL OF TALOD TOWN

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ABSTRACT:

Antagonism is an open interaction within a community wherein one species produces factors that enables it to survive and dominate within the community. Study of this interaction helps us in quantifying or estimating the richness of the community. Bacterial antagonism depends on production of toxins, enzymes and other antimetabolites. Soil sample of various farms in and around Talod town were collected to measure the bacterial antagonism therein Nutrient media was inoculated and production of clear zone was observed. Colonies producing the zone were studied for their microscopic and inhibitory characteristics. Considerable antagonism was observed and the results can help us in the study of community dynamics.

KEY WORDS: *Bacterial antagonism, Diversity, Community Dynamics.*

INTRODUCTION:

Antagonism is the relationship between two organism in which one is the inhibiting the growth of the other. In agriculture, certain bacteria are used as antagonists to suppress or inhibit the growth of other bacteria or fungi. These bacteria are used to control plant pest [1, 2, 3]. Antagonistic bacteria mostly grow in the rhizosphere and microorganisms that can grow in the rhizosphere are ideal for use as biocontrol agents. Since the rhizosphere provides the front line defence for root against attack by pathogens.[4] Microbial antagonism of pathogen is especially important, leading to substantial disease control. Antagonism is also useful in controlling the soil microflora for optimum crop production and protection. Some produce enzymes like proteolytic enzyme and others produce antibiotics and still others toxins. The substance may be specific in its action, affecting only a few species, or it may be nonspecific, affecting a large number of organisms. Recently, antagonistic bacteria were used for biological control of soil-borne plant pathogens infecting plant roots [5]. An environmentally friendly approach to protecting plants from fungal pathogens is rhizobacterium-mediated biological control [6, 7]. Numerous studies have demonstrated the ability of several antagonistic bacteria to suppress diseases caused by fungal plant pathogens [8, 9]. Possible mechanisms antagonistic bacteria mediated disease suppression include direct antagonism of the pathogen by antagonistic bacteria [10, 11], and the induction of

systemic resistance in host plants which in turn, results in a reduction of disease development [12, 13]. Antagonistic bacteria comprise a heterogeneous group of bacteria that can be found in the rhizosphere, at root surfaces and in association with roots. In the present study isolation of antagonistic bacteria is intended from farms of Talod town.

MATERIALS AND METHODS:

Isolation of antagonistic bacteria from soil:

Soil sample were collected from 220 field locations, stored in polyethylene bags at room temperature and used to prepare soil dilution plates. Soil Extract agar (SEA), SEA plus and Potato-dextrose agar (PDA) and Dillon nutrient agar (NA) were used for isolation and culture of soil bacteria. Soil suspensions were prepared by suspending 1g soil in 9ml sterile distilled water. Different aliquots of this soil suspension were used to inoculate media agar plates by spread plate method, the plates were incubated at room temperature for 24 – 48 hours [18]. Clear zones surrounding the colonies were observed.

Zone producing colonies (ZPCs) were studied for their gram stain and antibacterial properties. Soil dilution plates were prepared in sterile distilled water and incubated at 37^0C for 24 hr [12,13].

Antibacterial study:

Laboratory cultures of *Salmonella typhi*, *Staphylococcus aureus*, *Proteus vulgaris*, *Escherichia coli, Enterobacter aerogenes, Shigella dysentriae, Pseudomonas aeruginosa* were used for this study.

Culture suspensions of ZPCs were prepared by suspending the colony in sterile distilled water and inoculated on the surface of nutrient agar plates by spread plate method.

Culture suspensions of lab test cultures mentioned above were then inoculated onto these plates by agar diffusion method and incubated at 37^0C for 24 hours in an incubator [16, 17]. The zone of inhibition was observed.

RESULT:

From among the various farms, fifteen distinct strains of antagonistic bacteria have been isolated. The highest average no. of zone producing colonies was observed in groundnut field (Graph: 1),

the highest ratio of no. of colonies **:** no. of zone producing colonies was observed in garden soil (Graph: 2).

Upon gram staining, 9 of the fifteen isolated strains of antagonistic bacteria were found to be gram positive, whereas the remaining 6 were gram negative.

The colony characteristics of the isolated zone producing colonies are observed in Table: 1.

The antibacterial study (Table: 2) revealed that whereas none of them could inhibited all the lab. cultures, all the isolated strains could inhibit at least two test cultures except strain no. 12. Eight strains could inhibit at least three test cultures, one strain could five test cultures. Among the lab test cultures, *E coli* was inhibited by all the isolated strains. *E aerogenes* was inhibited by four of the strains, *P aeruginosa* was inhibited by 9 strains, *S typhi* was inhibited by four strains, *S aureus* by five strains, *S dysentriae* by five isolated strains and *P vulgaris* by seven strains.

DISCUSSION:

The isolation of a variety of bacterial strains having antagonistic ability from the different soils indicates considerable variety within the microbial community. The present study helps us to get a closer look at the dynamicity in the interactions of the prokaryotic population within a local community. The ratio of zone producing colonies **:** no. of colonies is a parameter that can be used to measure the diversity of that region, the lower the ratio the greater appears the diversity in that region. This ratio though previously not considered in any of the antagonistic studies, can help us to understand the antagonistic potential within a prokaryotic community. The antibacterial spectrum was studied in terms of either inhibition or absence of inhibition. No further attempt to correlate it with the size of the zone was done. The strains isolated during the present study have a good potential for a range of applications like being useful as biocontrol agents, for antibiotic production, enzyme or other antimetabolite production [18]. The relationship between the type of the crop cultivated and the amount of zone production by the antagonistic prokaryotes isolated from within that farm needs to be further studied.

REFERENCES:

1. Abbas HK, Zablotowicz RM, Bruns HA, Abel CA. (2006): Biocontrol of aflatoxin in corn by inoculation with non- aflatoxigenic *Aspergillus flavus* isolates. *Biocontrol Sci. Technol*.16:437-449.

2. Brown RL, Cotty PJ, Cleveland TE. (1991): Reduction in aflatoxin content of maize by atoxigenic strains of *Aspergillus flavus. J. Food Prot.* 54:623-626.

3. Dorner JW, Cole R1, and Wicklow DT. (1999) Aflatoxin reduction in corn through field application of competitive fungi. *J. Food Prot.* 62:650-656.

4. Weller DM. (1998) Biological control of soilborne plant pathogens in the rhizosphere with bacteria. *Annu. Rev. Phytopathol.* 26:379-407.

5. Bloemberg GV, Lugtenberg BJ. (2001) Molecular basis of plant growth promotion and biocontrol by rhizobacteria. *Curr. Opin. Plant Biol.* 4:343–350.

6. Kurze S. (2001) Biological Control of Fungal Strawberry Diseases by *Serratia plymuthica* HRO-C48. *Plant Dis* 85:529–534.

7. Whipps JM. (1997) Ecological considerations involved in commercial development of biological control agents for soil-borne diseases. In: Van Elsas JD, Trevors JT, Wellington EHM, editors. *Modern Soil Microbiology.* 525–546.

8. Amadioha AC. (2000) Controlling rice blast *in vitro* and *in vivo* with extracts of *Azadirachta indica*. *Crop Prot.*19:287–290

9. Fridlender M, Inbar J, Chet I. (1993) Biological control of soilborne plant pathogens by a β-1,3 glucanase-producing *Pseudomonas cepacia*. *Soil Biol. Biochem.* 25:1211–1221.

10. Ramamoorthy V, Raguchander T, Samiyappan R. (2002) Induction of defenserelated proteins in tomato roots treated with *Pseudomonas fluorescens* Pfl and *Fusarium oxysporum f.* sp. *lycopersici*. *Plant Soil.* 239:55–68.

11. Schneider S, Ullrich WR. (1994) Differential induction of resistance and enhanced enzyme activities in cucumber and tobacco caused by treatment with various abiotic and biotic inducers. *Physiol. Mol. Plant Pathol.*45:291–304.

12. Johnson LF, Curl EA, Bond JH, Friboure HA. (1959) Methods for studying soil microflora-plant disease relationship. 178.

13. Lockhead AG. (1940) Qualitative studies of soil microorganism influence of plant growth on the character of the bacterial flora. *Can. J. Res. C.* 18:42-53.

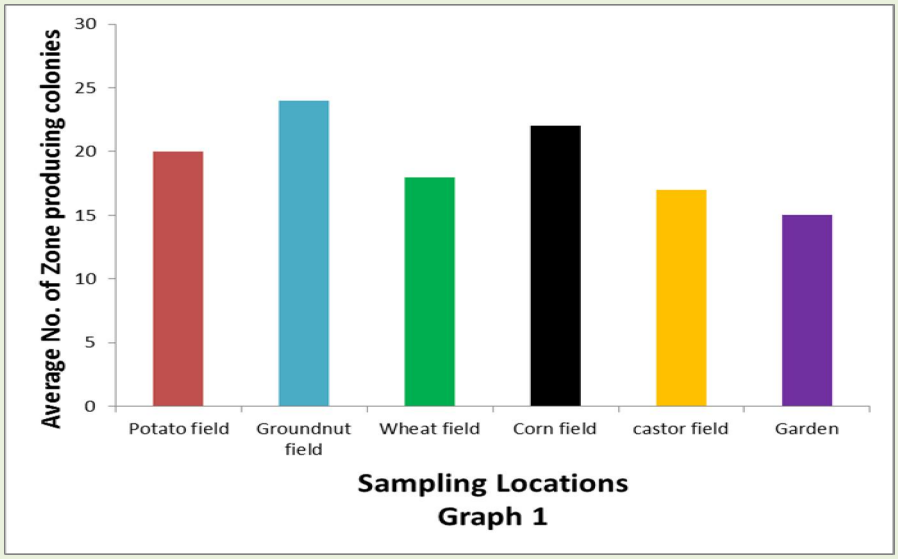
14. Pare D. (1956) Effect of substrate on a microbial antagonism, with reference to soil conditions. *Brit.Mycol.Soc.Trans*.39:239-259.

15. Wood R.K.S. (1951) The control of diseases of lettuce by the use of antagonistic organism. **I**. The control of *Botrytis cinerea*. Pers. *Ann. Appl. Biol.*38:203-216.

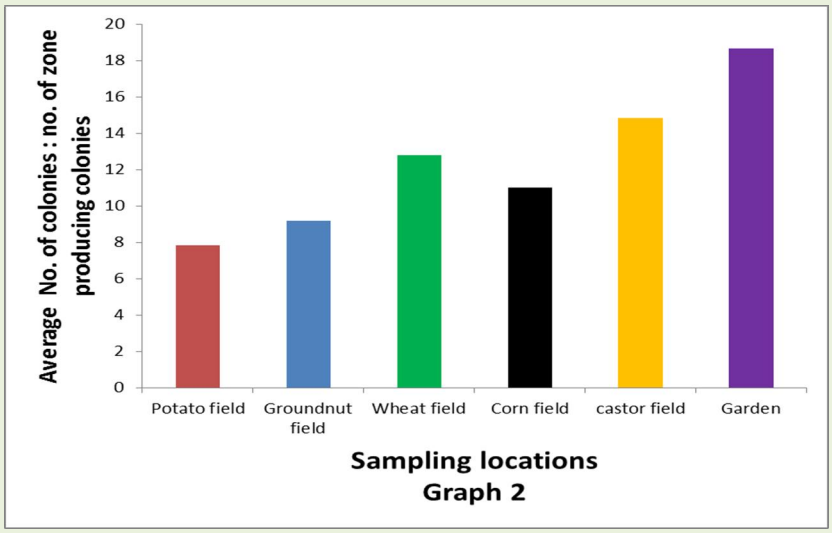
16. Annear DI. (1968) The effect of temperature on resistance of *Staphylococcus aureus* to methicillin and some other antibioics. *Med J Aust. Mar16*;1 (11): 444 – 446.

17. Griffith LJ, Mullins CG. (1968) Drug resistance as influenced by inactivated sensitivity discs. *Appl. Microbiol. Apr;*16(4):656–658.

18. Benson HJ. (2002) Microbiological Applications Laboratory Manual in General Microbiology. McGraw Hill. 8:128.



Graph 1



Graph 2

TABLE 1: THE COLONY CHARACTERISTICS OF THE ISOLATED ZONE PRODUCING COLONIES

Strain	*E.coli*	*E.aerogenes*	*S.typhi*	*S.dysentriae*	*P.aeruginosa*	*S.aureus*	*P.vulgaris*
1	+	-	-	-	+	+	-
2	-	+	-	-	-	+	-
3	+	-	+	+	-	+	-
4	+	-	-	-	-	-	+
5	-	+	-	+	+	-	+
6	-	+	-	-	+	-	-
7	+	-	+	-	-	+	-
8	+	+	-	+	-	-	+
9	+	+	-	-	+	-	-
10	-	-	+	-	-	+	-
11	+	+	-	+	+	-	+
12	-	-	-	-	+	-	+
13	-	+	-	-	+	-	+
14	+	+	+	-	+	-	+
15	-	-	-	+	+	-	-

TABLE 2: THE ANTIBACTERIAL STUDY

Strain	Size	Shape	Margin	Texture	Opacity	Elevation	Pigment
1	Small	Round	Even	Rough	Opaque	Raised	White
2	Big	Round	Even	Mucoid	Opaque	Raised	Dull White
3	Big	Round	Even	Smooth	Transparent	Flat	None
4	Small	Spherical	Uneven	Rough	Transparent	Convex	None
5	Big	Rod	Even	Dry	Opaque	Flat	Yellow
6	Small	Round	Even	Smooth	Opaque	Flat	White
7	Small	Round	Even	Smooth	Transparent	Convex	None
8	TAB	Irregular	Uneven	Rough	Transparent	Semi convex	None
9	Big	Irregular	Uneven	Rough	Opaque	Raised	white
10	Small	Irregular	Even	Glistening	Opaque	Raised	Shiny white
11	Small	Round	Even	Rough	Opaque	Raised	None
12	Big	Round	Even	Dull	Opaque	Flat	Light Pink
13	Small	Round	Entire	Smooth	Transparent	Convex	None
14	Big	Round	Uneven	Rough	Opaque	Flat	Off white
15	Big	Round	Uneven	Rough	Opaque	Raised	Off white