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Influence of bacteria isolated from panchagavya on seed germination and seed vigour in wheat

Among indigenous technologies used by farmers, use of panchagavya has been given importance since age old days. Panchagavya is one such organic product helpful for plant growth. In Sanskrit, panchagavya means the blend of five products obtained from cow. It is proved to be an efficient plant growth stimulant that enhances the biological efficiency of crops and the nutritional quality of the fruits and vegetables. It is used as foliar spray, through soil application along with irrigation water, seed or seedling treatment etc. For foliar spray 3 per cent concentration is being used by farmers (Natarajan, 2002).

An attempt was made at the Institute of Organic Farming, University of Agricultural Sciences, Dharwad, during the 2007-08 in order to know the effect of bacteria isolated from panchagavya on seed germination and seed vigour in wheat.

Panchagavya was prepared using the ingredients viz., cowdung (5kg), cow urine (3l), cows milk (2l), curd made from cow milk (2l), ghee made from cow milk (1l), sugarcane juice (3l), tender coconut water (3l) and ripened banana (12 Nos). All the above substrates were added to a wide mouthed mud pot and kept open under shade. The contents were stirred twice a day for about 20 minutes both in the morning and evening to facilitate aerobic microbial activity. Swaminathan (2007) reported the presence of naturally occurring beneficial microorganisms predominantly lactic acid baceria, yeast, actinomycetes, photosynthetic bacteria and certain fungi in panchagavya. After fifteen days of incubation, the fermented product "Panchagavya" was used as a source for isolation of bacteria. The serial dilution and standard plate count method was used for isolation of bacteria from panchagavya. The plates were incubated at 28±20C for one week and the colony counts were recorded. The predominant bacterial colonies (fifteen) grown on nutrient agar plates were subcultured on nutrient agar slants for further use.

For germination test, wheat seeds were dipped in broth of bacterial isolates for ten minutes and kept on germination paper. On 8th day, the germinated seeds were counted and the per cent germination was computed by using the formula

$$\text{Germination percentage} = \frac{\text{No of seeds germinated}}{\text{No of seeds sown}} \times 100$$

Seedling length (cm): On eighth day of germination test, ten normal seedlings were taken out carefully at random from each treatments and measured from the tip of primary root to the tip of apical shoot. The average length of ten seedlings was calculated and expressed as mean seedling length in centimeters.

Seedling vigour index: The seedling vigour index was calculated adopting the method suggested by Abdul-Baki and Anderson (1973) and expressed in whole number treatmentwise.

Vigour Index = Germination percentage x Seedling length

The data obtained on seed germination percentage, seedling length and seedling vigour index in different treatments are given in Table 1. On 8th day after sowing, significantly highest percentage germination (99%) was noticed in the seeds treated with bacterial culture PB9 and PB15 while significantly lowest germination was recorded in uninoculated seeds which indicated certain role of bacterial isolates in promoting seed germination.

Significant variation in seedling length was observed due to inoculation of different isolates. The seeds inoculated with PB9 has registered significantly higher seedling length and

Table 1. Effect of inoculation of bacterial cultures on seed germination, seedling length and vigour index in wheat

Treatments	Germination percentage	Seedling length (cm)	Seedling vigour index
T1- inoculated with PB1	92	22.24	2046
T2- inoculated with PB2	88	20.6	1814
T3- inoculated with PB3	91	20.48	1864
T4- inoculated with PB4	91	24.4	2221
T5- inoculated with PB5	88	19.44	1711
T6- inoculated with PB6	87	24.29	2113
T7- inoculated with PB7	92	20.29	1867
T8- inoculated with PB8	95	26.5	2517
T9- inoculated with PB9	99	28.5	2822
T10- inoculated with PB10	95	23.64	2251
T11- inoculated with PB11	91	26.81	2440
T12- inoculated with PB12	92	27.48	2528
T13- inoculated with PB13	98	18.19	1783
T14- inoculated with PB14	90	23.65	2129
T15- inoculated with PB15	99	25.02	2477
T16- uninoculated control	85	16.5	1403
SEm ±	0.55	0.34	36.79
CD	1.61	1.00	106.27

Table 2. Indole aceti acid, gibberellic acid production and biocontrol potential of general bacteria isolated from panchagavya

General bacterial Isolates	IAA (µg/25ml)	GA (µg/25ml)	Biocontrol effect	
			Result	Per cent inhibition
PB1	6.54	1.18	-ve	5.5
PB2	4.80	2.09	-ve	5.5
PB4	3.12	-ve	-ve	nil
PB5	4.37	-ve	+ve	87
PB6	-ve	-ve	+ve	74
PB7	-ve	-ve	+ve	83
PB8	9.27	-ve	+ve	81
PB9	12.18	3.81	+ve	83
PB10	-ve	-ve	-ve	5.2
PB11	-ve	2.54	-ve	nil
PB12	3.81	-ve	-ve	nil
PB13	-ve	1.54	-ve	nil
PB14	5.18	-ve	+ve	76
PB15	9.09	1.27	+ve	80

seedling vigour index while the seedling length and seedling vigour index was markedly lowest in control T16.

Further these isolates were used to study their biocontrol potential as well as IAA and GA production. Biocontrol test was done against the pathogen Sclerotium collected from the Department of Plant Pathology, UAS Dharwad. The pathogen was spotted in the center marked area in the petriplate containing media and test isolate was spotted on the side of pathogen and the plate was kept for incubation for 3-4 days. The zone of inhibition indicates the ability of test isolate to suppress the growth of pathogen. Based on the zone of inhibition per cent inhibition was calculated. Among the isolates tested, seven isolates showed positive effect in suppressing the growth of the pathogen.

This study clearly brought out that panchagavya contains bacteria producing plant growth promoting substances as well as bacteria having biological deterrent activities (Table 2). Presence of such beneficial microbial biomass might have resulted in improved seed germination, seedling length and seed vigour in wheat indicating panchagavya as an efficient plant growth stimulant.

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