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Effect of microorganisms and enriched livestock dung extract on wheat plant boom parameter in agriculture

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Abstract
This have a look at investigated the outcomes of Azotobacter chrocooccum strain MAC-27, Pseudomonas sp. P-36, and their interactions on wheat performance. The experimental layout was split plot factorial with a whole randomized block design. The remedies protected four chemical fertilizers (0, 50, 75 and a hundred% dose fertilizers) and four tiers of plant growth promoting rhizobacteria (Azotobacter chrocooccum strain MAC-27, Pseudomonas sp. P-36, combination of those bacteria, and manipulate). At time of physiological maturity, wide variety of spikes in keeping with unit area, range of spikelet and grain wide variety in line with spike, thousand grain weigh, grain yield, harvest index, organic yield, plant top, stem diameter and protein content material had been measured. Resulted indicated that the mixed software of Azotobacter and Pseudomonas accelerated grain yield, harvest index, organic yield and protein content by using 34.3, 7.7, 12.5 and thirteen.6%, respectively as compared to the controls. Azotobacter and Pseudomonas inoculation plus Fertilization reduced chemical fertilizers software (25-50%) in the area. results of this examine endorse that farmer can received the identical wheat yield if they follow half of traditional intake of chemical fertilizers alongside Azotobacter and Pseudomonas.

Keywords: azotobacter, pseudomonas, microorganisms, enriched, wheat

Introduction
Microorganism play important role in improving soil health and crop productivity by fixing nitrogen, solubilizing phosphate, secreting plant growth promoting substances and suppress plant pathogens. Nitrogen fixing microorganism, which are called as diazotrophs, constitute a large group of marginally related bacteria. Diazotrophs are aerobes, facultative anaerobes and anaerobes.

To increase crop yield is using the beneficial microorganisms. Plant growth promoting rhizobacteria (PGPR) like Azotobacter and Pseudomonas that can grow in the root environment and be effective on plant growth Mechanisms that can promote plant growth include production of phytohormones, and the inclusion of wheat plant with PGPR increased the growth characteristics of wheat.

Inoculation of Azotobacter after one month of composting of organic waste increased N content but inoculation of Azotobacter Atthecom posting did not affect N content. Composting with rock phosphate significantly increased citrate soluble P, which further increased by inoculation with Aspergillus awamori the nitrogen fixing bacteria, Azotobacter chroococcum and phosphate solubilizing fungi, Aspergillus awamori caused marked decrease in C: N ratio and increase in P concentration of vermin compost prepared from farm waste and cattle dung with Eisenia fetida that the Azotobacter chroococcum as a biofertilizers compensated N fertilizer in Mango. Azobacter chroococcum application also favored P, Kuptake and micronutrient contents that are plant growth promoting bacteria (PGPB) influence the growth, yields and nutrient uptake by an array of mechanism. They selected seven different plant promoting traids and antagonistic ability to screen 207 bacteria isolated from composts. 54% of PGPB were from farw waste compost (FWC), 56% from rice straw compost (RSC), and 64% from Gliricidia vermiccompost (GVC) and41% from macro fauna associated with FWC. Twelve isolate based on different plant growth promoting triads and seed vigor index were evaluated at glasshouse for plant growth promoting activity on pearl millet. Maximum increase in plant weight was by SerratiamarcescensEB67 (56%), Pseudomonas sp. CDB35 (52%) and Bacillus circulansEB35 (42%) and resulted that the synergistic effect of selected bacteria applied with composts ongrowth of pearl millet.Free living nitrogen fixer and associative diazotrophs also helped nodulation in legume crops. Inoculation of Azospirillum brasilense along with Bradyrhizobium japonicum to soybean plants increased leghemoglobin content up to 39% and 23% in nodulation.

Materialsand Methods
Analysis of cattle dung extract
Cattle dung was mixed properly with distilled water in 1:4 ratio to prepare slurry. Theslurry was kept on shaker for 12 h at 120 rpm at 28ºC and filtered through double layer ofmuslin cloth and autoclaved for 20 minutes at 121ºC.

Plant Analysis
From each pot I have selected two square meters, in which number of spikes per unit area, number of spikelet andgrain number per spike, thousand grains, shoot dry length, root dry length, shoot dry weight and root dry weight of wheat plant, harvest index, stem diameter and measured. Protein content.

Analysis of *Azotobacter chroococcum* and *Pseudomonas* sp. in different amendments of Cattle dung extract

Cattle dung extract was enriched with different carbon substrate having following treatments-

1) Cattle dung extract
2) 1% Glucose + Cattle dung extracts
3) 1% Sucrose + Cattle dung extracts
4) Jensen's broth + 10% Cattle dung extract
5) Nutrient broth + 10% Cattle dung extract

Estimation of *Azotobacter chroococcum* and *Pseudomonas* sp.

Viable count of *Azotobacter chroococcum* (Mac-27) and *Pseudomonas* sp. (P-36) in cattle dung extract with different amendments was estimated by spread plate method using Jensen's medium and Nutrient medium respectively. Log cfu/ml of culture was recorded at different time intervals up to 90 days.

Experimental setup and design

The experimental treatments were arranged in split plot factorial based on a complete randomized block design including four phosphorus fertilizer levels (0, 50, 75 and 100 % of fertilizer requirements), four levels of plant growth promoting rhizobacteria including Azotobacter chrocooccum strain 5, Pseudomonas fluorescens 187, mixture of these bacteria, and control. The experiment was replicated three times; total numbers of treatments were 48. Each plot consisted of five lines with 5 meter length, 25cm row and 10 cm plant spacing. Nitrogen fertilizer of urea at rate of 200 kg ha-1 was added to each pot. Nitrogen fertilizer was top dressed in three portions, one third at the time of planting, one third be ore flowering and the remaining at the time of grain filling.

Result and Discussion

The results were conducted to find out a cheap substrate for multiplication of bio inoculants as various and other nutrients are quite expensive which enhance the cost ofbio fertilizers production and effect of Azotobacter chroococcum and Pseudomonas sp. bacteria on wheat plant root revealed that cattle dung has organic carbon (43.5%) along with N content (0.78%), P (0.62%) and K (1.58).

Biochemical analysis of Cattle Dung

Cattle dung (on dry weight basis) was analyzed for organic C, total N, C/N ratio, Cellulose, hemicelluloses, lignin, total P, Total K and pH. Result indicated that the cattle dungcontained 43.5% organic carbon, 0.78% nitrogen, 55.8 C/N ratio, 23.3% cellulose, 18.8%hemicelluloses, 15.1% lignin, 0.62% phosphorus, 1.58% potassium and pH was 7.4. (Table 1).

Table 1: Chemical analysis of cattle dung (on dry basis)

Organic C (%)	43.5
Total N (%)	0.78
C/N ratio (%)	55.8
Cellulose (%)	23.3
Hemicelluloses (%)	18.8
Lignin (%)	15.1
Total P (%)	0.62
Total K (%)	1.58
pH	7.4

Effect of *Azotobacter chroococcum*in enriched cattle extract on shoot length ofwheat plant

A pot experiment was conducted to evaluate the effect of microbial enriched cattle dung extract on shoot and root growth of wheat plant. Recommended dose of fertilizers (RDF) in the form of diammonium phosphate (DAP) and urea were applied and it was compared with 50% RDF and without fertilizers treatment. Effect of all the amendments on plant growth was observed after 60 days of sowing under pot house conditions. These amendments were tested without fertilizers, at 50% RDF and 100% RDF. All the inoculated treatments showed effective increase in shoot length. Maximum shoot length was observed with T4 treatment (31.5, 36.3, 41.1 cms) followed by T5 (30.5, 35.8, 40.9 cms), T3 (29.9, 34.9, 40.5 cms) and T2 (29.1, 34.2, 39.8 cms). These value in uninoculated control were (28.5, 33.3, 36.2 cms).These value were significantly higher when compared with uninoculated control (Fig 1).

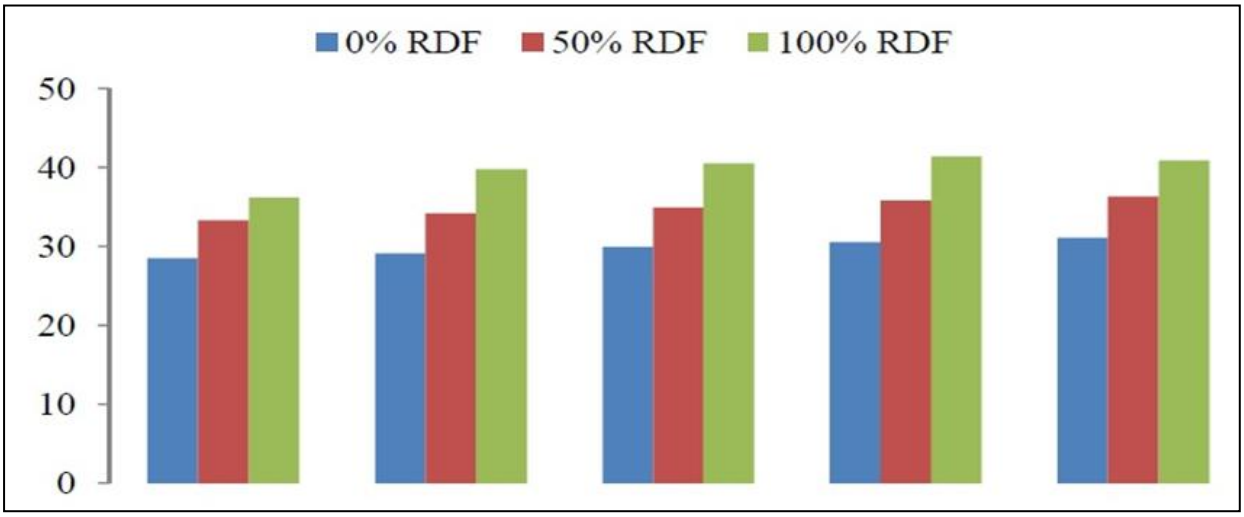

Fig 1: Effect of A. chroococcum Mac-27 in enriched cattle dung extract on shoot lengthof wheat (WH-711)

Table 2

0% RDF	T1(Control)	T2(CDE + Mac-27)	T3(JB + 10% CDE + Mac-27)	T4(1 % Glucose + CDE + Mac-27)	T5(1 % Sucrose + CDE+ Mac-27)	Mean	CD at 5%
	28.5	29.1	29.9	31.2	30.5	29.9	0.54
50% RDF	33.3	34.2	34.9	36.3	35.8	34.9	0.48
100% RDF	36.2	39.8	40.5	41.1	40.9	39.7	0.83
Mean	32.7	34.4	35.1	36.2	35.7	34.8	

Effect of *Pseudomonas* sp. in enriched cattle extract on shoot length of wheat plant

Effect of *Pseudomonas* sp. (P-36) in enriched cattle dung extract on shoot length of wheat plant was observed after 60 days of sowing under pot house conditions. These amendments were tested under controlled condition at 0% RDF, 50% RDF and 100% RDF. All the inoculated treatments showed effective increase in shoot length. Maximum shoot length was observed with T4 treatment (30.2, 34.9, 41.1 cms) followed by T5 (31.2, 34.7, 40.6 cms), T3 (29.4, 34.1, 39.8 cms) and T2 (28.7, 33.3, 39.3 cms). In the UN inoculated control these values were (27.3, 32.5, 36.1 cms).These values were significantly higher when compared with un inoculated control (Fig 2).

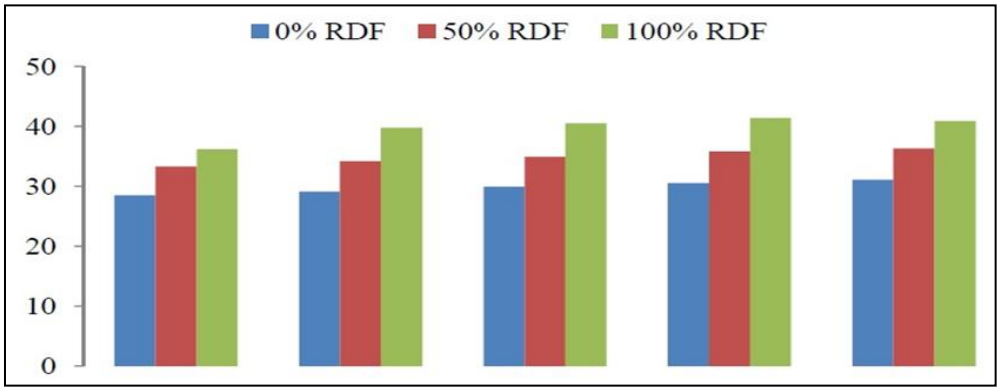

Fig 2: Effect of Pseudomonas sp. in enriched cattle extract on shoot length of wheat plant

Table 3

0% RDF	T1(Control)	T2CDE+ P-36	T3(NB+10% CDE+P-36)	T4(1 % (1% GLUCOSE+CDE+P-36)	T5(1 % (1% SUCROSE +CDE+P-36)	Mean	CD at 5%
	27.1	28.7	29.4	30.9	30.1	29.4	0.36
50% RDF	32.5	33.3	34.1	34.9	34.7	33.9	0.42
100% RDF	36.1	39.3	39.8	41.1	40.6	39.4	0.78
Mean	31.9	33.8	34.4	35.6	35.1	34.2	

Effect of *Azotobacter chroococcum* in enriched cattle extract on shoot dry weight of wheat plant

Shoot dry weight was estimated after drying the plant sample at 80ºC in the hot airoven. Effect of *Azotobacter chroococcum*. (Mac-27) in enriched cattle dung extract on shootdry weight of wheat plant was observed after 60 days of sowing under pot house conditions. All the inoculated treatments showed increase in shoot dry weight. Maximum shoot dry weight was observed with T4 treatment (1.991, 2.485, 2.789 g) followed by T5 (1.977, 2.463, 2.713 g); T3 (1.874, 2.323, 2.651 g) and T2 (1.811, 2.236, 2.539 g); while in the uninoculated control these value were (1.781, 2.143, 2.463 g). These values were hesevalue were significantly higher over inoculated control (Fig 3).

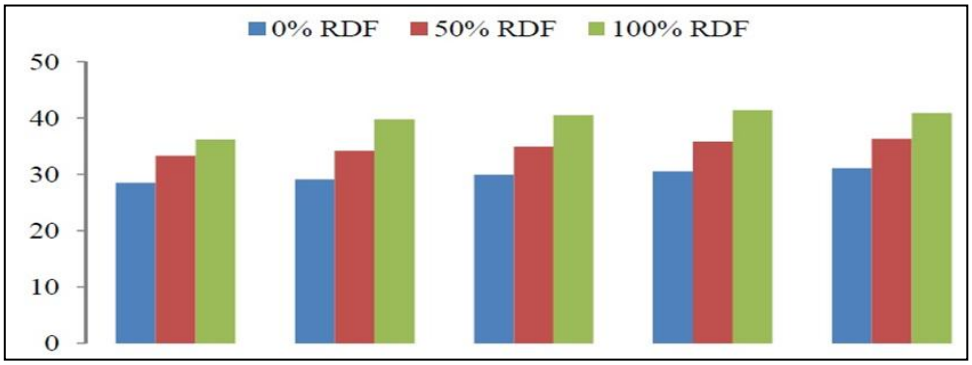

Fig 3: Effect of Azotobacter chroococcum. in enriched cattle extract on shoot dry weightof wheat plant

Table 4

0% RDF	T1	T2	T3	T4	T5	Mean	CD at 5%
	1.781	1.811	1.874	1.991	1.977	1.887	0.04
50% RDF	2.143	2.236	2.323	2.485	2.463	2.330	0.06
100% RDF	2.463	2.539	2.651	2.789	2.713	2.631	0.05
Mean	2.129	2.195	2.282	2.421	2.384	2.282	

Effect of *Pseudomonas* sp. in enriched cattle extract on shoot dry weight of wheat plant

Shoot dry weight was estimated after drying the plant sample at 80ºC in the hot airoven. Effect of *Pseudomonas* sp. (P-36) in enriched cattle dung extract on shoot dry weight ofwheat plant was observed after 60 days of sowing under pot house conditions.

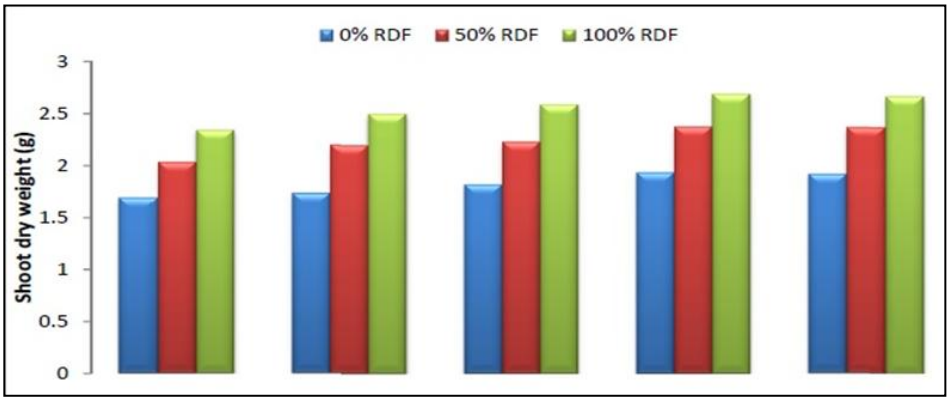

Fig 4: Effect of *Pseudomonas* sp. in enriched cattle extract on shoot dry weight of wheat Plant.

Table 5

0% RDF	T1	T2	T3	T4	T5	Mean	CD at 5%
	1.69	**1.733**	**1.821**	**1.938**	**1.917**	**1.820**	**0.34**
50% RDF	2.035	2.198	2.331	2.378	2.367	2.241	0.62
100% RDF	2.343	2.501	2.589	2.693	2.653	2.559	0.96
Mean	2.023	2.144	2.247	2.415	2.312	2.206	

All the inoculated treatments showed increase in shoot dry weight. Maximumshoot dry weight was observed with T4 treatment (1.938, 2.378, 2.693 g) followed by T5 (1.917, 2.367, 2.653 g); T3 (1.821, 2.231, 2.589 g) and T2 (1.733, 2.198, 2.501 g) as compared touninoculated control. (1.691, 2.035, 2.343 g).These value was significantly higher whencompared with uninoculated control (Fig 4). The treatment T4 having cattle dung extract (CDE) + 1% glucose was numerically at par to T5 treatment having CDE + 1% sucrose.

Effect of *Azotobacter chroococcum*.in enriched cattle extract on root dry weightof wheat plant

Root dry weight was estimated after drying the sample at 100ºC in the hot air oven at60 DAS. Maximum root weight was estimated in T4 treatment i.e. CDE + amended with 1%glucose at 0% RDF, 50% RDF and 100% RDF. These value were 0.281, 0.315 and 0.332 g,respectively. These values were numerically equal to T5 treatment (CDE + 1% sucrose) at their respective fertilizers doses. These value were significantly higher when compared withT1 (control) or T2 (CDE alone) (Fig 5).

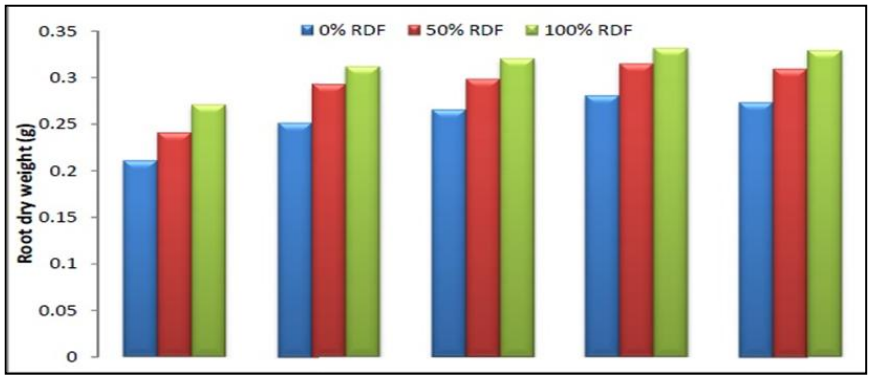

Fig 5: Effect of Azotobacter chroococcum. in enriched cattle extract on root dry weightof wheat plant

Table 6

0% RDF	T1	T2	T3	T4	T5	Mean	CD at 5%
	0.211	0.251	0.266	0.281	0.273	0.256	0.12
50% RDF	0.241	0.293	0.299	0.315	0.309	0.291	0.18
100% RDF	0.271	0.312	0.321	0.332	0.329	0.313	0.16
Mean	0.241	0.285	0.295	0.309	0.304	0.287	

Effect of *Pseudomonas* sp. in enriched cattle extract on root dry weight of wheat Plant

Root dry weight was estimated in the treatments inoculated with *Pseudomonas* sp. (P-36) after drying the root sample at 100ºC in the hot air oven at 60 days of plant growth sosimilar trends as compared to *A. chroococcum* inoculation. Maximum root weight was noticein T4 treatments having CDE + 1% glucose (fig 8). These value were 0.263, 0.311 and 0.331g, respectively at 0% RDF, 50% RDF and 100% RDF. These value were numerically higherover T5 treatment but significantly differ to T2 and T1 treatments. The lowest value in rootweight was recorded in T1 (control). These values have also been depicted by bar diagramsas shown in (Fig 6).

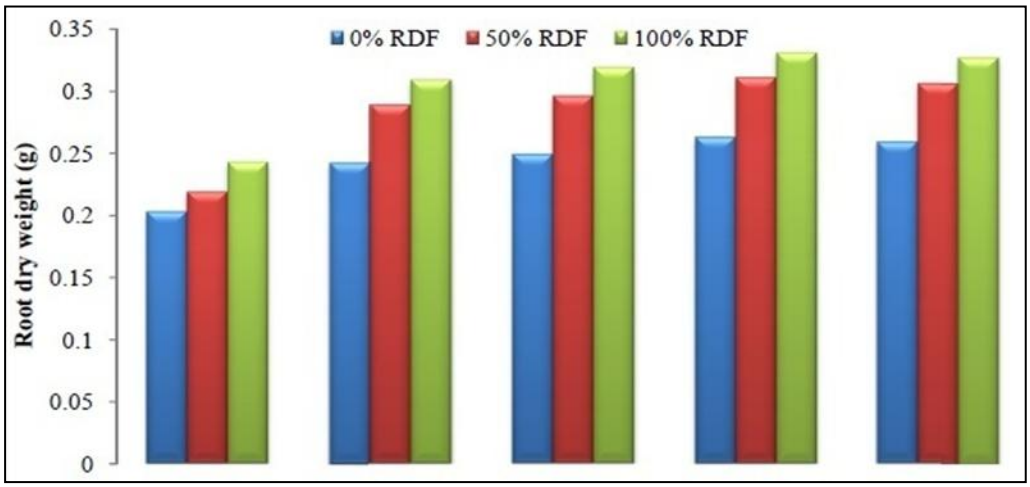

Fig 6: Effect of *Pseudomonas* sp. in enriched cattle extract on root dry weight of wheat plant

Table 7

0% RDF	T1	T2	T3	T4	T5	Mean	CD at 5%
	0.203	**0.243**	**0.249**	**0.263**	**0.259**	**0.243**	**0.08**
50% RDF	0.219	0.289	0.296	0.311	0.306	0.284	0.09
100% RDF	0.243	0.309	0.319	0.311	0.327	0.306	0.08
Mean	0.222	0.280	0.288	0.302	0.297	0.278	

Conclusions

1. Analytic composition of cattle dung showed 7.4 pH, 43.5% organic carbon, 0.78% nitrogen, 55.8% C/N ratio, 23.3% cellulose, 18.8% hemicelluloses, 15.1% lignin, 0.62% phosphorous, 1.58% potassium respectively.
2. Enriched cattle dung extract showed higher population of A. chroococcum Mac-27 and Pseudomonas P-36 up to 30 days of incubation, while in later stages, there was decline in log number of cells.
3. The cattle dung extract with amendments was inoculated was with A. chroococcum Mac- 27 and Pseudomonas P-36. The enriched cattle dung extract was used as culture for growth of wheat crop.
4. In general, enriched cattle dung extract with beneficial micro-organism at different carbon substrate improved the quality of the cattle dung extract which improved various plant growth parameters in wheat under controlled conditions.

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