After completion of two crop cycles, available N and P but not K status of the soil was significantly affected due to different treatments. Improvement in available N and P status was noted due to increase in fertilizer rate from 75 to 100% of RDF. These results are similar to the findings of Budhar *et al.* (1991). Legume crops including GM provided considerable amount of residual N to the forthcoming cereal crops. Soybean and GM added rice at the end of kharif season and chickpea only with 100% RDF at the end of rabi season left significant amount of nitrogen over cereal crop of the respective season. The inclusion of GM with 100% RDF increased the available P status of the soil due to mobilization of phosphorous from the subsoil to the upper region. Bellakki and Bedanur (1997) and Dhiman *et al.* (2000) also found similar results.

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(Received: November 2002; Revised: April 2003)

Madras Agric. J. 90 (10-12) : 736-738 October-December 2003

Research Notes

Studies on the effect of potassium humate on the biological properties of the soil with Green gram

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Microbial population is often used as a guide for evaluation of soil fertility status. The microbial biomass constitutes the active fraction of soil organic matter whose fast turn over makes it important as potential source of nutrients. Mathur and Paul (1966) stated that *Pseudomonas* could use humic acid as a source of carbon and nitrogen. Humic substances may influence the growth of micro-organisms by virtue of their chelation properties.

The field experiment was conducted at Sundapalayam Village of Coimbatore district on Alfisol (Typic Haplustalf) of Somayanur series to study the effect of humic acid on the biological properties of soil, with and without fertilizers on green gram Var. Vamban GG2 during March-May 2001. The following main plot treatments were imposed namely No fertilizers (M_1), 100% recommended dose of fertilizer (M_2) and 75% recommended dose of fertilizer (M_3). The sub plot treatments were no humic acid, foliar spray (0.1%), seed soaking (1%), 10, 20, 30 and 40 kg ha^{-1} of humic acid as potassium humate designated as S_1, S_2, S_3, S_4, S_5, S_6 and S_7 respectively. The soil samples were collected from the green gram field on 45^{th} day after sowing and the microbial population was estimated. The results on microbial population clearly indicated the significant effect of application

able 1. Effect of humic acid and fertilizers on the bacterial and fungal population of the soil (g^{-1} of dry soil)

Treat-ments	Bacteria (x 10^6)				Fungi (x 10^4)			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
S1	7.55684	10.65213	9.62134	9.27677	4.35865	5.38868	4.278911	4.67541
S2	9.74211	13.68875	12.36582	11.93223	4.40112	6.33841	5.36812	5.36922
S3	16.43651	18.51201	17.23012	17.39288	7.73652	9.74821	8.6012	8.69531
S4	10.78124	12.70212	11.71562	11.73299	4.35681	6.54821	5.44821	5.45108
S5	17.30012	20.30012	19.42103	19.00709	5.54631	9.46821	7.45826	7.49089
S6	18.81952	21.28721	20.33105	20.14593	7.54987	8.48961	7.52694	7.88547
S7	20.43642	23.66847	21.30985	21.80491	6.61821	10.85012	9.56512	9.01115
Mean	14.43897	17.25869	15.99926		5.795341	8.118779	6.892396	
CD (P=0.05)								
M		0.20135				0.05861		
S		0.16102				0.06102		
MxS		0.32104				0.11021		
SxM		0.26810				0.10112		

Table 2. Effect of humic acid and fertilizers on the actinomycetes population (g^{-1} of dry soil) and phosphatases activity in soil (μg p-nitrophenol g^{-1} hr^{-1})

Treat-ments	Actinomycetes (x 10^3)				Phosphatase activity (μg p-nitrophenol g^{-1} hr^{-1})			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
S1	2.24651	4.24981	3.25974	3.25202	18.95861	22.62845	22.86015	21.48241
S2	4.14128	5.45871	4.33213	4.64404	19.12815	22.82103	23.22487	21.72468
S3	5.35891	7.45231	4.36827	5.72649	20.93124	24.45812	24.56102	23.31679
S4	4.49851	6.43851	5.32671	5.42124	23.31211	25.45835	24.60158	24.45735
S5	5.56102	7.64213	6.45213	6.55176	23.68471	25.75924	25.42948	24.95781
S6	8.75971	9.74851	8.64957	9.05259	24.33251	25.75941	25.70134	25.26442
S7	7.72418	10.84213	9.56213	9.37614	23.73251	25.72643	25.13424	24.86439
Mean	5.47001	7.40458	5.99295		22.01141	24.65872	24.50181	
CD (P=0.05)								
M		0.04213				0.90214		
S		0.05410				0.63681		
MxS		0.09251				1.35671		
SxM		0.09130				1.12130		

of humic acid with 100 per cent recommended dose of fertilizer on enhancing the microbial population of the soil as compared to the recommended dose of fertilizer alone. The treatments M_2S_7 recorded the highest value of 23.67, 10.85 and 10.84 g^{-1} of dry soil for bacteria, fungi and actinomycetes respectively (Table 1). This favourable effect of humic acid on microbial population might be attributed to the stimulating effect of humic acid on the growth of micro organisms (Kudrina, 1951). Soil application of humic acid was better in influencing the microbial population than foliar spray and seed soaking. However a favourable increase in the microbial population in seed soaking than in foliar spray was noticed. This indicated that any method of application of humic acid but to soil would be highly beneficial.

With regard to phosphatase activity the fertilizer treatment M_2 receiving 100 per cent recommended dose of fertilizer recorded significantly the highest value of 24.95 µg P nitrophenol g^{-1} hr^{-1} (Table 2). Among the humic acid treatments S6 (25.26 µg P nitro phenol g^{-1} hr^{-1}) recorded the highest value. The treatment combination M2S5 recorded the highest value of 25.80 µg P nitrophenol g^{-1} hr^{-1}. The result obtained in the present study was in line with Kiss *et al.* (1975) who stated that the mineral fertilizers containing P compounds increased the soil phosphatase activity. Soil application of humic acid significantly influenced the phosphatase activity, which might be attributed to the increased microbial population in the soil. The addition of humic acid along with mineral fertilizers showed a marked increase in the phosphatase activity of the soil. This might be due to the increased supply of essential nutrients which in turn might have enhanced the microbial activity and hence the phosphatase activity in soil.

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(Received: December 2002; Revised: July 2003)

Madras Agric. J. 90 (10-12) : 738-741 October-December 2003

Research Notes

Genetic determination of grain yield and quality traits through its components in *Triticum duram*

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Genetic determination of yield and its components helps the breeder in identifying traits, which are responsible for achieving high yield. The magnitude along with the direction of association between two traits determines the usefulness of the correlation and helps in simultaneous improvement for these traits. The present investigation was taken to work out the inter-relationships of grain yield and quality traits through its components by correlation and path-coefficient analysis. Sixty genotypes of durum wheat were evaluated in the *rabi* 2001 at the farm of Indian Agricultural Research Institute - Regional Station, Indore. The genotypes constituted a collection of genetic stocks, released varieties and advance lines. The genotypes were sown in a RBD with a row to row and plant to plant spacing of 30 and 10 cm, respectively. Observations were recorded on five randomly selected plants for each entry from each replication for various traits including quality traits like protein content, sedimentation value and β carotene.

Analysis of variance revealed significan differences for all the characters under study The range of variations was quite high fo most of the characters (Table 1). High heritabilit along with high genetic advance was notice for the characters like plant height, grains pe spike, sedimentation value and β-carotene Therefore, these traits would be effective i selecting genotypes possessing high grain yield Grain yield per plant showed low heritabilit along with low genetic advance, which reveal that it was influenced more by the environment Phenotypic coefficient of correlation was recorde high for the characters like productive tillers grain weight per spike, grain yield per plan sedimentation value and β-carotene, indicatin influence of environment was considerable fc these traits.