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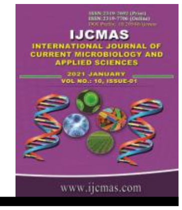

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Effect of Nutrient Levels and Plant Growth Regulators on Test Weight, Protein Content and Post-harvest Soil Nutrient Status of Pearl Millet

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A B S T R A C T

A field experiment was carried out to study the effect of nutrient levels and plant growth regulators on protein content, test weight and post-harvest soil nutrient status of pearl millet during *rabi* 2016 at TNAU, Coimbatore, Tamil Nadu, India. Ten treatments consists of nutrient levels and plant growth regulators were imposed using Randomized Block Design with three replications. Growth regulators are chemical substances helps to enhance plant growth, development of for high yield and improved grain quality or facilitated harvesting. Application of 125 % RDF (T_1) treatment recorded more available nitrogen, available soil phosphorus was more in the treatment 100 % RDF + foliar application of chloromequat chloride @ 250 ppm at 20 and 40 DAS which at par with 125 % RDF + foliar application of NAA @ 250 ppm at 20 and 40 DAS and RDF treatments. Application of 125 % RDF + foliar application of chloromequat chloride at 250 ppm at 20 and 40 DAS was more available soil potassium. There was no significant effect on protein and test weight content of pearl millet with nutrient levels and plant growth regulators application.

Introduction

Pearl millet (*Pennisetum glaucum* (L) is the staple cereal of arid and semi-arid drier regions of the country. India is the largest Pearl millet growing country, contributing 42 per cent of production in the world. In India, pearl millet is pre-dominantly cultivated as a rainfed crop in diverse soils, climatic condition and indispensable arid zone. In India pearl millet was cultivated in 7.128 million hectares with 8.06 million tonnes production and productivity of 1132 kg/ha during 2015-16 (Season and Crop Report 2015-16). The major pearl millet producing states in India are Rajasthan, Maharashtra, Gujarat, Uttar Pradesh and Haryana. Land, which is not only thirsty but also hungry. The estimated nutrient removal by all dryland crops is to the tune of 7.4 million tonnes (excluding secondary and micro nutrients). Approximately drylands receive 10 per cent of total nutrients use in the country, which constitutes about 1.4 million tonnes. There remains a net negative balance of about 6.0 million tonnes (Venkata Lakshmi, 2001).

The productivity of pearl millet is very low in India mainly due to poor plant stand and less use of fertilizers. Pearl millet removes 72 kg N, P_2O_5 and K_2O ha^{-1} annum^{-1}, whereas only 10-20 kg of these nutrient are being supplied through fertilizers. Therefore, there is need to improve fertility management along with optimum plant density of current hybrids for sustainable production and productivity. The plant growth regulators (PGRs) have potential for increasing crop productivity under environmental stress. Growth regulators are chemical substances which can alter the growth and developmental processes (Espindula *et al.*, 2009) leading to increased yield, improved grain quality or facilitated harvesting.

Materials and Methods

Field experiment was conducted at Tamil Nadu Agricultural University, Coimbatore during *Rabi* 2016 to study the effect of nutrient levels and plant growth regulators on protein content and post-harvest soil nutrient status of pearl millet (Cumbu hybrid CO 9). The farm is situated at 11^0 North latitude and 77^0 E longitude and at an altitude of 426.7 m above mean sea level.

The experiment was laid out in randomized block design with three replications and ten treatments *viz*. T_1 - 125% RDF*, T_2 - 100 % RDF*, T_3 - 75% RDF*, T_4 - 125% RDF* + Foliar application of chlormequat chloride @ 250 ppm at 20 and 40 DAS, T_5 - 100 % RDF* + Foliar application of chlormequat chloride @ 250 ppm at20 and 40 DAS, T_6 - 75% RDF* + Foliar application of chlormequat chloride @ 250 ppm at 20 and 40 DAS, T_7 - 125% RDF* + Foliar application of NAA @ 40 ppm at 20 and 40 DAS, T_8 - 100 % RDF* + Foliar application of NAA @ 40 ppm at 20 and 40 DAS, T_9 - 75% RDF* + Foliar application of NAA @ 40 ppm at 20 and 40 DAS and T_{10} – Control. The crop was sown at a spacing of 45 cm x 15 cm. The pearl millet hybrid of CO-9 was used for the experiment with 5 kg ha^{-1} seed rate. The soil of the experimental field was in slightly alkaline (8.07), normal in EC (0.86 dsm^{-1}), sandy clay loam in texture, low in OC (0.59 %), low in available nitrogen (260.0 kg ha^{-1}), medium in available P_2O_5 (20.4 kg ha^{-1}) and high in available K_2O (694.2 kg ha^{-1}). The nitrogen application was done in two splits, 50 % of N, full dose of P_2O_5 and K_2O were applied as a basal and remaining 50 % N at 30 days after sowing of pearl millet. Soil sample from each treatment in the plot were selected at random and tagged for taking the post-harvest soil analysis of NPK and protein content. The protein content was calculated by multiplying the nitrogen content of the grain with 6.25 factor. Available soil nitrogen (N) was estimated by the method described by Subbiah and Asija (1956) and the nitrogen status was expressed in kg ha^{-1}, Soil available phosphorus was determined as described by Olsen *et al.*, (1954) using spectrophotometer and expressed in kg ha^{-1}. Soil available Potassium was estimated by neutral normal ammonium acetate extraction method using Flame Photometry (Stanford and English, 1949) and expressed in kg ha^{-1}.

Results and Discussion

Application of 125 % RDF (T_1) treatment recorded 219 kg ha^{-1} available nitrogen and it was followed by application of 100 % RDF + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS recorded 208.3 kg ha^{-1} and 125 % RDF + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS treatments available nitrogen 204.0 kg ha^{-1} (Table 1 and Fig. 1). The higher nitrogen uptake by pearl millet under higher level of available nitrogen is due to favorable effects of nitrogen on growth parameters and yield attributes which resulted in higher grain and stover yields. Application of 120 and 140 kg N ha^{-1} were found equally effective in increasing nitrogen uptake by grain, stover and total nitrogen uptake by crop were significantly higher over lower level of 100 kg N ha^{-1}, however nitrogen and phosphorus uptake by grain and stover in pearl millet were not markedly influenced by different levels of phosphorus (Bhuva and Sharma, 2015)..

Table.1 Effect of nutrient levels and plant growth regulators on post harvest nutrient status

Treatment	Post-harvest soil nutrient status (kg/ha)		
	N	P	K
T_1- 125 % RDF*	219.0	15.0	504
T_2- 100 % RDF*	200.0	18.5	480
T_3- 75 % RDF*	194.8	14.7	452
T_4- 125 % RDF* + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS	204.0	16.0	557
T_5- 100 % RDF* + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS	208.3	20.0	492
T_6- 75 % RDF* + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS	179.2	14.3	479
T_7- 125 % RDF* + foliar application of NAA @ 40 ppm at 20 and 40 DAS	195.4	18.8	522
T_8- 100 % RDF* + foliar application of NAA @ 40 ppm at 20 and 40 DAS	201.2	15.5	468
T_9- 75 % RDF* + foliar application of NAA @ 40 ppm at 20 and 40 DAS	182.7	17.8	432
T_{10}- Control	123.5	12.8	404
S. Ed	9.18	0.78	22.86
C.D at 5 %	19.30	1.65	48.04

Table.2 Effect of nutrient levels and plant growth regulators on protein content and test weight of pearl millet

Treatment	Protein (%)	Test weight (g)
T_1- 125 % RDF*	12.31	11.21
T_2- 100 % RDF*	12.14	10.20
T_3- 75 % RDF*	10.01	10.62
T_4- 125 % RDF* + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS	12.20	12.38
T_5- 100 % RDF* + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS	12.18	12.37
T_6- 75 % RDF* + foliar application of Chloromequat chloride @ 250 ppm at 20 and 40 DAS	10.12	11.54
T_7- 125 % RDF* + foliar application of NAA @ 40 ppm at 20 and 40 DAS	12.64	12.69
T_8- 100 % RDF* + foliar application of NAA @ 40 ppm at 20 and 40 DAS	12.50	11.74
T_9- 75 % RDF* + foliar application of NAA @ 40 ppm at 20 and 40 DAS	10.32	11.34
T_{10}- Control	9.24	9.11
S. Ed	0.54	0.54
C.D at 5 %	1.01	NS

Fig.1 Effect of nutrient levels and plant growth regulators on post harvest soil nutrient status of N, P and K

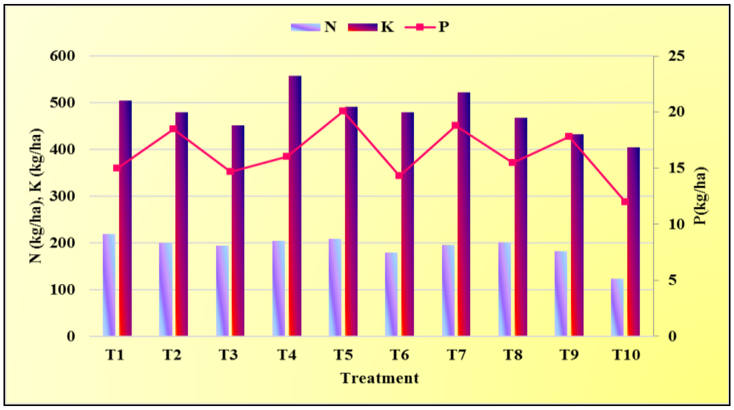
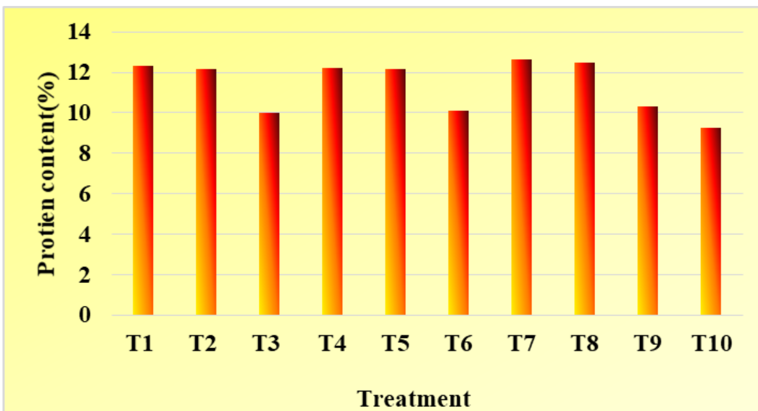


Fig.2 Effect of nutrient levels and plant growth regulators on protein content (%) of pearl millet



(*80:40:40 kg of N, P and K ha^{-1})

The increased supply of nitrogen and their higher uptake by plants might have stimulated the rate of various physiological processes in plant which led to increased growth and yield parameters and resulted in increased seed and stover yields. Available soil phosphorus of 20.0 kg ha^{-1} noticed in the treatment 100 % RDF + foliar application of chloromequat chloride @ 250 ppm at 20 and 40 DAS which at par with 125 % RDF + foliar application of NAA @ 250 ppm at 20 and 40 DAS with available phosphorus of 18.8 kg ha^{-1} and RDF treatments (Table 1 and Fig. 1). A better supply of phosphorus has been associated with prolific root growth resulting in enhanced water and nutrient absorption. Application of 125 % RDF + foliar application of chloromequat chloride at 250 ppm at 20 and 40 DAS was more available soil potassium (557 kg ha^{-1}) and which followed by 125 % RDF + foliar application of NAA @ 40 ppm at 20 and 40 DAS has the available potassium in the with 522 kg ha^{-1}. The application of K along with NP significantly increased the grain and straw yield of pearl millet (Shrivastava Swarnima *et al.*, 2016). It might be due to the fact that added nitrogen and phosphorus increased the N and P content in grain by providing favourable environment inside the plant and higher photosynthetic efficiency, which favoured better growth and crop yields. There was no significant influence of nutrients and growth regulators on the Protein content. The different nutrient levels and plant growth regulators had no significant influence on the test weight of pearl millet at the time of harvest (Table 2 and Fig. 2)

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