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Effect of integrated nutrient management on nutrient uptake and post harvest soil available nutrient status in fodder maize

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Abstract
Field experiments were conducted during Navarai and Samba season of 2010 at farmer's field in C. Mutlur Village of Chidambaram, Tamil Nadu to the study the effect of integrated nutrient management on nutrient uptake and post harvest nutrient status in fodder maize. The experiments were conducted in randomized block design replicated thrice with seven treatments viz., (T_1) Recommended fertilizer dose of NPK, (T_2) 75% of recommended dose + vermiwash, (T_3) 50% recommended fertilizer dose, (T_4) 75% of recommended fertilizer dose+ Humic acid, (T_5) 50% recommended fertilizer dose+ Humic acid, (T_6) 75% recommended fertilizer dose+ Panchagavya, (T_7) 50% recommended fertilizer dose+ Panchagavya. The nutrient uptake by crop viz., N, P_2O_5, K_2O were markedly influenced by 75% of recommended fertilizer dose + humic acid (T_4). The least of nutrient uptake was recorded under recommended fertilizer dose of NPK (T_1) in both seasons. The post harvest soil available nutrient status was found to be higher with 75% of recommended fertilizer dose (T_1) in both the seasons as compared to other treatments. The least post harvest soil available nutrient status was recorded under (T_4) 75% of recommended fertilizer dose+ humic acid in both the seasons.

Keywords: Fodder maize, humic acid, vermiwash, panchagavya, nutrient uptake, post harvest nutrient status

Introduction
India possesses enormous livestock of million heads and with such a huge population of livestock; the country should have been over flowing with milk. Instead, we are suffering from perpetual shortage of milk, meat and wool. The major reason for the low production of livestock products is the shortage of fodder. The estimated requirement of fodder is being 822 M.T. as against the availability of 488 M.T. (Sharma, 2009) [8]. In India, it is estimated that only about 4.4 percent cultivated area is under fodder cultivation while in Tamil Nadu, fodder crops occupy about 8.6 L ha. It may not be possible to increase the area under fodder crops because of ever increasing pressure on available food grains and commercial crops. So the only alternative to meet fodder requirement is to increase the yield of fodder per unit area per unit time. This can be achieved by intercropping of high yielding varieties of cereal fodders and forage legumes and by studying the appropriate nutritional dose to the fodder crops.

Among the cultivated non-legume fodder maize is the most important crop which can be grown round the year under irrigated condition. Maize is a quick growing and high yielding crop inhabitant with no hazard of prussic acid poisoning and is considered as a valuable fodder crop. Fodder maize is highly relished by cattle as it is rich in protein, carbohydrate, minerals and vitamins. The role of humic substances viz., vermiwash, panchagavya (especially humic acid an important constituent of organic matter) on the transformation and availability of N in soil is found to be an unexploited area. Therefore, an attempt was made to study the role of organic substances (humic acid) on the transformation and availability of nitrogen as well as on the performance of fodder maize and high yield of fodders.

Earthworm secretions have found to be the beneficial effect on crop growth with the presence of various nutrients in considerable quantities. Panchagavya is a combination of five products obtained from cow which is used in traditional medicines extensively. Natarajan (2002) [5] revealed that among the plant growth stimulants defined in Vrkshayurveda, panchagavya was found to be the best in enhancing the biological efficiency of crop plants and the quality of fruits and vegetables. Higher nutrient uptake and more use efficiency in both main and ratoon crops of annual moringa were observed with the application of panchagavya. Cow's curd is rich in microbes (*lactobacillus*) that are responsible for fermentation (Manral Chandha, 1996) [4].

Foliar spray of coconut water as growth hormone increased the bio-mass and yield in sweet pepper by 200 per cent over control (Matna-fil and Lopez, 1997) [3] Reddy and Singh (1998) [7] observed that cow's urine (Gomootra) was rich in urea and acted both as nutrients as well as hormones. As far as fodder maize is concerned, a very few works has been done with integrated nutrient management, particularly nil with the combination of humic acid, vermiwash and panchagavya, Therefore experiments were programmed study the effect of integrated nutrient management on nutrient uptake and post harvest nutrient status in fodder maize.

Materials and methods

Field experiments were conducted during Navarai and Samba season of 2010 at farmer's field in C. Mutlur Village of Chidambaram, Tamil Nadu to the study the effect of integrated nutrient management on nutrient uptake and post harvest nutrient status in fodder maize. The soil is moderately drained clay loamy in texture with low available Nitrogen (210.27 kg/ha), medium in available P_2O_5 (17.95 kg/ha), high in available K_2O (320.07 kg/ha), organic carbon (0.40%), organic matter (0.70%), soil reaction (pH) 8.1, Electrical conductivity (0.18 dSm^{-1}). The experiment was laid out in Randomized Block Design (RBD) with three replications and Seven treatments include., (T_1) Recommended fertilizer dose of NPK, (T_2) 75% of recommended dose + vermiwash, (T_3) 50% recommended fertilizer dose + Vermiwash, (T_4) 75% of recommended fertilizer dose+ Humic acid, (T_5) 50% recommended fertilizer dose+ Humic acid, (T_6) 75% recommended fertilizer dose+ Panchagavya, (T_7) 50% recommended fertilizer dose+ Panchagavya. The experimental field was ploughed with tractor drawn cultivator in a criss-cross manner. The crop was sown on 7th January 2010 (Navarai) and 9th July 2010 (Samba) adopting the spacing of 30×15 cm. Fertilizers were applied plot wise as per the treatment schedule. The RDF is 60:40:40 N: P_2O_5:K_2O Kg ha^{-1}. Need based plant protection measures were taken up based on economic threshold level of pest and diseases. The NPK uptake (kg ha^{-1}) was recorded at harvesting stage. The post harvest soil samples drawn from each plot were air dried and gently beaten with a wooden mallet and sieved through 2 mm nylon sieve mesh. Then, the soil samples were analyzed for available N, P and K.

Preparation of vermiwash solution

Different layers of the bed around 25 worms of *Perionyx excavate* (native species) and another 25 worms of *Eudrilus euginae* (African species) were introduced in prepared container. On the 16th day, the tap was closed and on top of the unit, a 5 litre vessel perforated at the base like a sprinkler was gradually allowed to sprinkle on it. The water slowly percolated through the compost and drilospheres, carrying with it nutrients from freshly formed castings, as well as washings from the drilospheres through the filter unit. The washings were collected and used as a foliar spray. The vermiwash was clear and transparent pale yellow in colour. Vermiwash @ 4% was applied as per the treatment schedule on 15 and 25 DAS. The Physio-chemical properties of vermiwash are N (200.00 ppm), P_2O_5 (0.05%), K_2O (68.52), Sodium (124.00 ppm), pH (6.83).

Humic acid

Humic acid of 2% concentration was obtained from the research wing of Neyveli Lignite Corporation for the experiment. From this, 0.2% concentration was prepared and used for soil application. Humic acid @ 125 g ha^{-1} was applied as soil application per treatment schedule on 15 and 25 DAS. Composition and nutritional status of humic acid- C (58.3), H (5.2), N (1.2),S(0.6), Fe (0.290), Zn (0.007), Mn (0.017), Cu (0.001).

Preparation of Panchagavya

Improved Panchagavya was prepared by using the following ingredients: cow dung (5 kg), cow's urine (3 litres), cow's milk (3 litres), cow's curd (2 litres), Cow's ghee (1 litre). Panchagavya @ 3% was applied as per treatment schedule on 15 and 25 DAS. The nutrient content of panchagavya are N (4.43%), P_2O_5 (0.02%), K_2O (0.94%), Fe (0.93), Zn (0.26), Mn (0.23).

Results and Discussions

Nutrient uptake

Integrated nutrient management practices significantly influenced the nutrient uptake of fodder maize. Among the various treatments tried, application of 75% of recommended fertilizer dose + humic acid (T_4) registered the highest N, P_2O_5, K_2O uptake of fodder maize (Table 1). Easy availability and adsorption of nutrients in the plant system enhanced the growth of the crop thereby leading to better uptake of nutrients. Foliage applied nutrient play a vital role in accelerating the root growth contributing to better absorption of nutrients from the soil. The least uptake of nutrients was observed under recommended fertilizer dose of NPK (T_1) which might be due to non-availability of adequate supply of major nutrients to the crop. The results of the present findings are in agreement with the reports of Mathan *et al*., (1996) in blackgram and Nikunja chaeka and Kakati (1996) [6] in mung bean.

Table 1: Effect of integrated nutrient management on nutrient uptake (kg ha^{-1}) of fodder maize

Treatments	Nitrogen uptake (kg ha^{-1})		Phosphorous uptake (kg ha^{-1})		Potassium uptake (kg ha^{-1})	
	Navarai 2010	Samba 2010	Navarai 2010	Samba 2010	Navarai 2010	Samba 2010
T_1	74.98	72.92	12.72	11.75	115.64	113.67
T_2	80.15	78.81	13.06	11.98	121.10	121.07
T_3	75.16	78.86	12.76	11.79	117.28	116.04
T_4	85.12	83.64	13.26	12.63	128.36	126.48
T_5	82.67	81.22	13.16	12.21	124.74	124.12
T_6	76.27	69.98	12.96	11.87	119.48	118.76
T_7	77.61	76.21	12.72	11.87	117.84	116.26
S.Ed	0.69	0.68	0.03	0.02	0.76	0.72
CD(p=0.05)	1.44	1.42	0.07	0.06	1.58	1.49

Post harvest soil available nutrients

Post harvest soil available nutrient status is greatly influenced by integrated nutrient management practices (Table 2). Among the treatments, application of recommended fertilizer dose of fertilizers (T_1) alone recorded the highest post harvest soil nutrient status. This may be due to poor utilization of applied fertilizers by crop for its growth and development. The least post harvest soil nutrient status was observed under T_4 due to increased availability of nutrients caused higher biological yield fodder maize resulted in lesser NPK status after harvest. The results are in line with the reports of Shivay *et al*., (2002) [9] in maize. The results of experiments carried out at C.Mutlur farmer's field showed that application of 75% of recommended fertilizer dose + humic acid enhanced NPK uptake of fodder maize. However, 100% RDF alone recorded higher post harvest soil nutrient status.

Table 2: Effect of integrated nutrient management on Post harvest soil available nutrient status (kg ha^{-1}) in fodder maize

Treatments	Nitrogen (kg ha^{-1})		Phosphorous (kg ha^{-1})		Potassium (kg ha^{-1})	
	Navarai 2010	Samba 2010	Navarai 2010	Samba 2010	Navarai 2010	Samba 2010
T_1	206.87	204.92	15.67	15.09	308.09	304.28
T_2	202.04	199.89	13.08	12.70	300.03	296.35
T_3	205.64	203.58	14.99	14.48	306.12	302.29
T_4	198.68	196.28	11.25	11.21	295.38	292.15
T_5	200.45	198.30	12.21	11.94	297.68	294.01
T_6	203.35	201.21	13.77	13.34	302.15	298.52
T_7	204.37	202.29	14.28	13.85	303.89	300.16
S.Ed	0.56	0.59	0.30	0.262	0.88	0.84
CD(p=0.05)	1.17	1.23	0.63	0.55	1.81	1.73

References

1. Chaudhari PM, Patil HE, Hankare RH. Effect of integrated nitrogen management in maize (*Zea mays* L.) on pattern of leaf area and dry matter production. Indian J Plant Sci. 2006; 1(1):17-21.
2. Day K. Onion and garlic stand a better chance with humics on the horizon. 2000; 1(4):1-2.
3. Matnafil JC, Lopez AM. The effect of coconut water growth hormones (CWGH) on the growth, development and yield of sweet pepper. The Philippines J Coconut Stud. 1997; 222:18.
4. Manral Chandha. Butter milk as plant growth promoter, Honey bee, January to March Issue, 1996.
5. Natarajan K. Panchagavya: A manual. Other India Press, Mapusa, Goa, India, 2002, 33.
6. Nikunja Chedka, Kakati NN. Effect of Rhizobium strains, methods of inoculation and level of phosphorous on mungbean. Legume Res. 1996; 19(1):33-39.
7. Reddy NS, Singh R. Effect of nitrogen and phosphorous on growth and yield of French bean (*Phaseolus vulgaris*). Indian. J Agron. 1998; 43(2):367-370.
8. Sharma KC. Integrated nitrogen management in fodder oats (*Avena sativa*) in hot arid ecosystem of Rajasthan. Indian J Agron. 2009; 54(4):459-464.
9. Shivay YS, Singh RP, Shivakumar BG. Effect of nitrogen on yield attributes, yield and quality of maize in different cropping systems. Indian. J Agric. Sci. 2002; 72(3):161-163.