Paper ID: 347
Theme 2. Grassland production and utilization
Sub-theme 2.3. Soil-plant-animal-human interrelationships

Fodder yield of baby corn (*Zea mays* L.) as influenced by mulching, liming and integrated nutrition management under foot hill condition of Nagaland

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Keywords: Baby corn, Green fodder yield, Integrated nutrition, Liming, Mulching

Introduction

Baby corn (*Zea mays* L.) being one of the most important dual purpose crop is grown widely round the year for its cob as well as green fodder in India. It has an edge over the other cultivated fodder crops due to its higher production potential, wider adaptability, fast growing nature and excellent fodder quality free from toxicants. Baby corn production has been directly integrated with dairying farms in different countries because only 13-20% of fresh ear weight is used as human food and the rest (silk, husk and green stalk) can be used as excellent feed materials for milch ruminants to improve their productivity. By adopting the good agro-techniques, it is possible to produce 40-45 t/ha of fresh green fodder, which could raise a net income of Rs. $40\text{-}45\times10^3$/ha as such it may prove to be a boon for small and marginal farmers for improving their socio-economic conditions. Hence, the mulching, liming and balanced nutrient management is the key input to ensure the higher productivity in terms of baby corn and fodder under the foot hill condition of Nagaland.

Materials and Methods

Field experiment was conducted at Research Farm of ICAR RC for NEH Region, Jharnapani, Nagaland during the two consecutive seasons of 2013 and 2014 in *kharif.* Soil of the experimental plot was sandy loam in texture, acidic in nature (pH 5.42), medium in soil organic carbon (0.71%), available P (14.1 kg ha^{-1}) and low in mineralizable N (201.2 kg ha^{-1}) and available K (173.2 kg ha^{-1}). Experiment was laid out in split plot design and replicated thrice. Treatment comprised of two levels of mulch *viz.* without mulch (control) and straw mulch and three levels of lime application in furrow *viz.* control, 0.5, and 1.0 t ha^{-1} in main plot and four levels of nutrient management *i.e.* control, 100% RDF (IN), 75% RDF through inorganic (IN) +25% RDN (ON) and 125% RDF (IN) +25% RDN (ON) in sub plot. The organic source of nitrogen (ON) was farm yard manures (0.5% N, 0.2% P and 0.5% K) on N equivalent basis applied in one month before sowing the crop. Lime was applied in furrow two weeks prior to sowing as per the treatments. Baby corn hybrid HM-4 was sown with a seed rate of 40 kg ha^{-1} at spacing of 40 cm × 20 cm. The recommended dose of N, P, K, S, Zn (100% RDF; IN) represents 150-80-60-30-10 kg N, P, K, S, Zn ha^{-1}. All the nutrients were applied as per treatment and source of N was urea whereas, P, K, S and Zn were applied through DAP, MOP, elemental sulphur and ZnO, respectively. Full doses of P, K, S and Zn and half of N were applied as basal and remaining half dose of N were top dressed in two equal splits at knee high and tassel emergence stages. Immature baby cobs were harvested within 2-3 days after silk emergence and same were weighed, dehusked and baby corn yield was recorded. After final picking, crop was harvested for green fodder and its yield was recorded. Data obtained for two years were pooled and statistically analyzed as per standard procedures.

Results and Discussion

Growth characters: Growth attributes *viz.* plant height, number of green leaf and dry matter production/plant were found to increase significantly with straw mulch treatments as compared to control (Table 1). This is probably due to more availability of soil moisture under mulching during the critical cropping period (Chakraborty *et al.*, 2008).

Increasing levels of lime application from 0 to 1.0 t ha^{-1} resulted in significant increase in all the growth attributes *i.e.*, plant height, number of leaf and dry matter production/plant (Table 1). This might be due to application of lime neutralizes the soil acidity and simultaneously increases the availability of P and other nutrients and suppresses the toxicity of Fe, Al and Mn.

Among the levels of integrated nutrition, application of 125% RDF (IN) + 25% RDF (ON) was recorded the maximum plant height, number of green leaf and dry matter production/plant and proved significantly superior over 75% RDF+25% RDN (ON) ,100% RDF (IN) and control (Table 1). This might be due to application of recommended dose of fertilizers with combined use of farm yard manures (FYM) resulted in higher nutrient uptake because it release sufficient amount of nutrient by mineralization at constant level during the cropping period (Brar *et al.*, 2001).

Baby cob, baby corn and green fodder yield: Baby cob, baby corn and fodder yield were increased significantly with application of straw mulching over the control (Table 1). The yield differences in baby cob, baby corn and green fodder were 43.75, 28 and 30.46%, respectively with mulching over control. This may be attributed to higher moisture status and consequently to better water balance in plant system at reproductive stage in mulched plots, which resulted in higher growth and yield attributes of the crop.

From the data, it was noted that there was a significant difference in baby cob, baby corn and green fodder yield with increasing level of lime application up to 0.5 t ha^{-1} and upper two levels did not touch the levels of significance (Table 1). Application of lime @ 1.0 t ha^{-1} increased the cob, corn and fodder yield significantly to the tunes of 15, 9.81 and 15.36%, respectively over the control. This might be due to Ca^{2+} meets the demand as well as creates favourable condition for better uptake of P; hence the liming is an important management practice in acid soil (Koacevic and Mitra, 2010).

Pooled analysis showed that baby cob, baby corn and green fodder yield were maximum with 125% RDF (IN) +25% (ON), which was 36.49, 21.82, 17.98% significantly higher, respectively over control. However, application of 75% RDF+25% RDF (ON) was recorded statistically similar in baby cob, baby corn and green fodder yield to 100% RDF (IN). Improvement in these yield parameters of crop may be attributed to the better nutrient availability and favourable effect on soil physical, chemical and biological properties under integrated nutrient management, resulting into higher yield (Jakhar *et al*., 2006).

Table 1: Effect of mulching, liming and integrated nutrition on growth and yield of baby corn (Poled data of 2 years)

Treatments	Plant height (cm)	Green leaves/ Plant (No.)	Dry matter/ Plant (g)	Baby cob yield (t/ha)	Baby corn yield (t/ha)	Green Fodder yield (t/ha)
Mulching						
Control	157.72	13.06	127.21	1.44	8.50	28.43
Straw mulch	174.35	15.47	150.05	2.07	10.88	37.09
SEM+	1.86	0.36	1.55	0.04	0.13	0.78
CD (P=0.05)	5.86	1.15	4.87	0.11	0.40	2.45
Liming (t/ha)						
Control	156.54	12.13	123.69	1.60	9.18	30.21
0.5	164.42	14.53	137.01	1.82	9.82	33.23
1.0	177.15	16.13	155.19	1.84	10.08	34.85
SEM+	2.28	0.45	1.89	0.04	0.15	0.95
CD (P=0.05)	7.17	1.41	5.97	0.14	0.49	2.99
Integrated nutrition						
Control	150.74	12.53	123.86	1.48	8.66	29.86
100% RDF (IN)	168.00	14.69	143.51	1.80	9.64	33.23
75% RDF + 25% RDF(ON)	166.45	14.03	139.33	1.71	9.91	32.72
100% RDF (IN)+25% RDF(ON)	178.95	15.82	148.82	2.02	10.55	35.23
SEM+	1.95	0.37	1.56	0.04	0.13	0.64
CD (P=0.05)	5.60	1.07	4.48	0.13	0.37	1.85

Conclusion

Based on the above findings, it may be concluded that straw mulching with application of lime in furrow @ 1.0 t/ha and 125% RDF (IN)+25% RDF (ON) proved the best for getting higher baby corn and fodder productivity under the foot hill condition of Eastern Himalaya, India.

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Acknowledgement

The authors are thankful to Tribal Sub Plan (TSP) for providing the financial assistance during the experimentation.The author is also sincerely acknowledge the to Director ICAR CARI Port Blair for providing the seed for conducting the experiment.