

# Effect of Sowing Time and Integrated Nitrogen Management on Yield and Post-harvest Soil Nutrient Status of Black Glutinous Maize (*Zea mays* L.)

## ABSTRACT

**Aim:** To study the effect of sowing time and integrated nitrogen management on yield and post-harvest soil nutrient status of black glutinous maize (*Zea mays* L.).

**Study design:** Factorial randomized block design (FRBD)

**Place and Duration of Study:** Experimental field of College of Agriculture, Central Agricultural University, Imphal, Manipur, pre-*kharif* season of 2018.

**Methodology:** The treatment consisted of four different integrated nitrogen management practices and three sowing dates.

**Results:** The result revealed that maximum cob length(16.97cm), cob girth(15.71cm), test weight(257g), grain yield (32.9 q/ha) and shelling % (80.31 %) was observed in the treatment N<sub>3</sub> (RDN- 75% through urea + 25% through FYM) among different integrated nitrogen management practices. The highest yield among different sowing dates was recorded on plants sown on 9<sup>th</sup> April (28.23 q/ha). The different integrated nitrogen management showed significant difference in residual nutrients and organic carbon in soil. Maximum available nitrogen (275.97 kg/ha), phosphorus (19.21 kg/ha), potassium (210.05 kg/ha) and organic carbon (1.10 %) were observed in treatment N<sub>4</sub> (RDN- 100% through FYM). Lowest values of nutrients under study were observed in treatment N<sub>1</sub> where the crop received only chemical fertilizer.

*Key words: Black glutinous maize, sowing time, INM, yield, soil nutrient status.*

## 1. INTRODUCTION

Maize (*Zea mays* L.) is one of the most important cereal crops in the world's agricultural economy both as food for man and feed for animals. Maize has been an important cereal crop owing to its highest production potential and adaptability to wide range of environment hence called as 'Queen of Cereals' (Choudhari and Channappagouda) [1]. It can be grown in *kharif*, *rabi* and summer seasons. Over 85 per cent of maize production in country is consumed as a source of human feed. In Manipur, it covers an area of 26.19 thousand hectares with a production of 57.94 million tonnes and productivity of 2240 kg/ha (Anon.,) [2].

Local glutinous maize is popular and commonly grown cultivar in Manipur. It has unique characteristic of soft and stickiness of kernel even though it is dried and stored for long time unlike the normal maize. Among the agro-techniques non-monetary inputs like sowing time and nutrient are the two management aspects to be considered for improving the yield of maize. Sowing at the right time will expose the maize crop to suitable weather elements required at different phenological stages resulting in better vegetative growth and yield. Highest productivity of crops in sustainable manner without deteriorating the soil and other natural resources could be achieved only by applying appropriate combination of different organic manures and inorganic fertilizers.

## 2. MATERIALS AND METHODS

The field experiment was undertaken during the pre-*kharif* season of 2018 at College of Agriculture, CAU, Imphal, Manipur to study the effect of sowing time and integrated nitrogen management on yield and post-harvest soil nutrient status of black glutinous maize (*Zea mays* L.). The experiment was laid out in factorial randomized block design (FRBD) with 12 treatments and 3 replications. The treatment consisted of four different integrated nitrogen management treatments and three sowing dates. FYM was applied 20 days before sowing as per treatment and well incorporated to the soil.

### Treatment details

(a) Sowing time: 3

S<sub>1</sub> – 1<sup>st</sup> March

S<sub>2</sub> – 20<sup>th</sup> March

S<sub>3</sub> – 9<sup>th</sup> April

(b) Nitrogen management: 4

N<sub>1</sub> – RDN (100 % through urea)

N<sub>2</sub> – RDN (50 % through urea + 50 % through FYM)

N<sub>3</sub> – RDN (75 % through urea + 25% through FYM)

N<sub>4</sub> – RDN (100 % through FYM)

\*RDN-recommended dose of nitrogen \*FYM-farm yard manure

## 3. RESULTS AND DISCUSSION

### 3.1 Effect of sowing time and integrated nitrogen management on yield and yield contributing factors of local glutinous maize

Integration of inorganic fertilizer and FYM influenced the cob length, cob girth, test weight, grain yield and shelling % and are presented in Table 1. The mean cob length (16.97 cm), cob girth (15.71 cm) and test weight (257g) were maximum and significantly more when crop was fertilized with RDN-75% through urea + 25% through FYM (N<sub>3</sub>). The results are in accordance with the earlier finding of Rajeshwari *et al.* [3] and Jadhav [4]. Owing to higher values yield attributes, the maximum grain yield

(32.9 q/ha) was obtained in treatment N<sub>3</sub>. The improved physical properties like water holding capacity and moisture retention provided a desirable soil condition for the root development, enhanced crop growth and yield (Selvi *et al.*) [5]. The highest shelling % was recorded in treatment N<sub>3</sub> (80.31 %) and it was significantly superior to rest of the other treatments. The results are in agreement with the earlier findings of Zakkam [6]. The highest mean cob length (15.5 cm) and cob girth (14.87 cm) was recorded in the plants sown on 9<sup>th</sup> April (S<sub>3</sub>). Such variation among different sowing time was also reported by Keerthi *et al.* [7]. Sowing at different time could not bring significant effect on test weight. Among the sowing dates, it could be seen from Table 1 that though sowing on 9<sup>th</sup> April (S<sub>3</sub>) recorded the maximum grain yield (28.23 q/ha), however it remained at par to sowing on 20<sup>th</sup> March (S<sub>2</sub>) but was significantly superior over sowing on 1<sup>st</sup> March (S<sub>1</sub>). The variation in among different sowing time was also supported by Verma [8] and Sulochana *et al.* [9].



Figure 1. View of cobs in treatment S<sub>3</sub>N<sub>3</sub>

Table 1. Effect of sowing time and integrated nitrogen management on yield and yield contributing factors of local glutinous maize

Treatment	Cob length (cm)	Cob girth (cm)	Test weight (g)	Grain yield (q/ha)	Shelling %
<b>S: Sowing time</b>					
S <sub>1</sub>	14.60	13.61	247.08	25.65	77.52
S <sub>2</sub>	15.20	14.51	250.17	27.49	78.55
S <sub>3</sub>	15.50	14.87	253.08	28.23	79.22
SE d (±)	0.23	0.35	2.31	0.38	0.48
CD (P=0.05)	0.48	0.72	NS	0.78	1.00
<b>N management</b>					
N <sub>1</sub>	14.75	13.91	248.00	24.67	77.82
N <sub>2</sub>	15.91	14.80	253.89	30.15	79.04
N <sub>3</sub>	16.97	15.71	257.00	32.90	80.31
N <sub>4</sub>	12.76	12.89	241.56	20.78	76.53
SE d (±)	0.27	0.40	2.67	0.44	0.56
CD (P=0.05)	0.56	0.83	5.53	0.91	1.16

### 3.2 Effect of sowing time and integrated nitrogen management on post-harvest nutrient status of the soil

The different integrated nitrogen management showed significant difference in residual nutrients and organic carbon in soil. Maximum available nitrogen (275.97 kg/ha), phosphorus (19.21 kg/ha), potassium (210.05 kg/ha) and organic carbon (1.10 %) were observed in treatment N<sub>4</sub> (RDN-100% through FYM). Lowest values of nutrients under study were observed in treatment N<sub>1</sub> where the crop received only chemical fertilizer. The increased in residual nutrients and organic carbon may be attributed to the contribution of nutrients from the organic pool. The benefit of organic manures on post-harvest available nutrients was also reported by Tatarwal *et al.* [10] and Ahmad *et al.* [11]. Though the residual available nutrients in soil was recorded highest in 9th April sowing but different sowing dates of maize could not bring significant effect in available nutrients of soil after the harvest of the crop.

Interaction between sowing time and integrated nitrogen management could not show significant effect on the residual available nutrients and organic carbon content in the soil.

**Table 2. Residual available nutrient (kg/ha) and organic carbon (%) in soil as influenced by sowing time and integrated nitrogen management**

Treatments	Available N (kg/ha)	Available P <sub>2</sub> O <sub>5</sub> (kg/ha)	Available K <sub>2</sub> O (kg/ha)	Organic carbon (%)
<b>S: Sowing time</b>				
S <sub>1</sub>	252.45	18.47	198.57	0.97
S <sub>2</sub>	257.67	18.64	200.24	0.98
S <sub>3</sub>	262.38	18.74	201.88	0.99
SE.d (±)	5.23	0.14	1.79	0.01
C.D. (P=0.05)	NS	NS	NS	NS
<b>N management</b>				
N <sub>1</sub>	239.73	18.05	186.84	0.82
N <sub>2</sub>	264.12	18.78	204.21	1.03
N <sub>3</sub>	250.18	18.41	199.81	0.96
N <sub>4</sub>	275.97	19.21	210.05	1.10
SE.d (±)	6.03	0.17	2.06	0.02
CD (P=0.05)	12.51	0.34	4.28	0.03

#### 4. CONCLUSION

On the basis of results obtained from the present investigation, it can be concluded that the local glutinous maize (*Zea mays* L.) responded well to application of RDN- 75% through urea + 25% through FYM in terms yield. Among the sowing time, the crop can be sown on 9<sup>th</sup> April and 20<sup>th</sup> March for obtaining better growth and higher yield of the crop. The maximum residual available soil nutrients and organic carbon was recorded from the treatment N<sub>4</sub> where RDN (100% through FYM) is given.

## REFERENCES

1. Choudhari VV, Channappagouda BB. Effect of organics on morpho-physiological traits and grain yield of maize (*Zea mays* L.). The Bioscan. 2015;10(1): 339-341.
2. Anonymous. Department of Agriculture, Manipur. 2016-17.
3. Rajeshwari RS, Hebsur NS, Pradeep HM, Bharamagoudar TD. Effect of integrated nitrogen management on growth and yield of maize. Karnataka J. Agric. Sci. 2007;20(2):399-400.
4. Jadhav K.L. Effect of integrated nitrogen management on growth and seed yield of maize (*Zea mays* L.). Doctoral dissertation. MPKV, Rahuri; 2010.
5. Selvi D, Santhy P, Dhakshinamoorthy M. Effect of inorganics alone and in combination with farm yard manure on physical properties and productivity of vertic Haplustepts under long term fertilization. J. Indian Soc. Soil Sci. 2005;53(3):302-307.
6. Zakkam M. Response of maize (*Zea mays* L.) to planting densities and nitrogen levels under late rabi conditions. Doctoral dissertation, Acharya Ng Ranga Agric. University; 2011.
7. Keerthi P, Reddy GP, Sunitha N. Effect of sowing time on growth and yield of sweet corn cultivars. Int. J. Curr. Microbiol. App. Sci. 2017;6(4):777-782.
8. Verma NK. Integrated nutrient management in winter maize (*Zea mays* L.) sown at different dates. J. of Plant Breeding and Crop Sci. 2013;3(8):161-167.
9. Sulochana NS, Dhewa JS, Bajia R. Effect of sowing dates on growth, phenology and agro meteorological indices for maize varieties. Bioscan. 2015;10(3):1339-1343.
10. Tatarwal JP, Ram B, Meena DS. Effect of integrated nutrient management on productivity, profitability, nutrient uptake and soil fertility in rainfed maize (*Zea mays*). Indian J. of Agron. 2011;56(4):373-376.
11. Ahmad W, Shah Z, Khan F, Ali S, Malik W. Maize yield and soil properties as influenced by integrated use of organic, inorganic and bio-fertilizers in a low fertility soil. Soil & Environment. 2013;32(2).