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Jakku Prasanna

Division of Agronomy, College of Agriculture, Pune, Maharashtra, India

Ghodke PB

Division of Agronomy, College of Agriculture, Pune, Maharashtra, India

Ubale SP

Department of Genetics and Plant Breeding, College of Agriculture, Pune, Maharashtra, India

Sanjuna Reddy N

Department of Soil science and Agricultural chemistry, College of Agriculture, Nagpur, Maharashtra, India

Warpe ST

Division of Agronomy, College of Agriculture, Pune, Maharashtra, India

Effect of nitrogen levels and cattle urine foliar sprays on yield and economics of maize (*Zea mays* L.)

Jakku Prasanna, Ghodke PB, Ubale SP, Sanjuna Reddy N and Warpe ST

Abstract

A field experiment was conducted to assess the effect of nitrogen levels and cattle urine foliar sprays on yield and economics of maize (*Zea mays* L.) at Agronomy Farm, College of Agriculture, Pune, during *Kharif*-2019. The experiment consisted of 16 treatment combinations based on four levels of the recommended dose of nitrogen (@ 0, 50, 75 and 100%) through urea and four levels of cattle urine foliar spray (@ 0, 5, 10 and 15%) taken at 25, 45 and 60 DAS replicated thrice in Factorial Randomized Block Design. The results revealed that the grain and stover yield of maize were influenced significantly and the statistically higher grain and stover yield was recorded with the application of 100% RDN (120 kg ha⁻¹). While the application of 10% cattle urine sprays recorded the statistically higher grain and stover yield which was followed by 15% cattle urine spray. In respect to the economics of maize, higher gross monetary returns, net monetary returns and B:C ratio was recorded with the application of 100% RDN whereas, the application of 10% cattle urine spray recorded statistically higher net monetary returns, gross monetary returns and B:C ratio followed by 15% foliar spray of cattle urine.

Keywords: Maize, nitrogen levels, cattle urine sprays, yield and economics

Introduction

Among cereals, maize (*Zea mays* L.) is an important food and feed crop, which ranks third after wheat and rice in the world. Because of its expanded use in the agro-industries, it is recognized as a leading commercial crop of great agro-economic value. It is also suitable for multiple cropping programme and forage purpose being a short duration crop. Due to its high yield potential, it is often referred to as 'Queen of cereals'. It is one of the most versatile crops in nature, which can be grown over wide range of climatic conditions and has acquired dominant role in farming sector and macroeconomics of Asian region.

The integrated nutrient management system has now assumed great importance firstly because of the present negative nutrient balance and secondly neither the chemical fertilizers alone nor the organic sources exclusively can achieve the production sustainability of soil as well as crops under highly intensive cropping system. In integrated nutrient management (INM), cattle urine can be efficiently used which helps in restoring and sustaining soil fertility and crop productivity.

Material and Methods

Field experiment was conducted to study the effect of nitrogen levels and cattle urine foliar sprays on yield and economics of maize at the Agronomy farm, College of Agriculture, Pune, during *kharif*-2019. The experiment was laid out in Factorial Randomized Block Design with 16 treatment combinations consisting of four levels of nitrogen (@ 0, 50, 75 and 100% RDN) and four levels of cattle urine foliar sprays (@ 0, 5, 10 and 15%) imposed to maize variety Phule Rajarshi. The foliar sprays were taken at 25, 45 and 60th days after sowing. The gross and net plot size was 5.00 m x 3.75 m and 4.20 m x 2.25 m, respectively. The maize seed was dibbled at a spacing of 75 x 20 cm².

A full dose of phosphorus and potassium was applied as a basal application and on the basis of recommended dose of nitrogen for maize @ 120 kg ha⁻¹ four levels of nitrogen were formulated as 0%, 50%, 75% and 100%. In order to undertake foliar sprays of cattle urine at 25, 45 and 60th DAS fresh cattle urine was collected at each time in early morning. Water sprays at respective days were undertaken for 0% as control.

Results and Discussion

The grain yield of maize was recorded significantly higher (31.49 q ha⁻¹) with the application of 100% (120 kg ha⁻¹) RDN. This was followed by the application of 75% RDN.

Corresponding Author:**Jakku Prasanna**

Division of Agronomy, College of Agriculture, Pune, Maharashtra, India

An application of 10% foliar spray of cattle urine recorded the significantly higher grain yield (29.50 q ha⁻¹). The grain yield was immediately followed by the application of 15% cattle urine foliar spray.

The significantly higher stover yield (33.36 q ha⁻¹) of maize was recorded with the application of 100 % RDN (120 kg ha⁻¹). The next best treatment was the application of 75% RDN. While the application of 10% cattle urine foliar spray recorded the highest stover yield (32.83 q ha⁻¹) whereas, the immediate following treatment was found with the application of 15% cattle urine foliar spray.

The higher gross monetary returns (76,335 ₹ ha⁻¹), net monetary returns (44,154 ₹ ha⁻¹) and B:C ratio (2.37) was recorded with the application of 100% RDN. While the application of 10% foliar spray of cattle urine recorded the significantly higher gross monetary returns (72,135 ₹ ha⁻¹), net monetary returns (40,780 ₹ ha⁻¹) and B:C ratio (2.30 ₹ ha⁻¹). This was followed by the foliar application of 15% cattle urine spray.

Sandal *et al.* (2009) [3] revealed that the application of 100% recommended NPK of maize significantly increased grain and stover yields. Devakumar *et al.* (2014) [1] concluded that the grain and stover yield of maize varied significantly under different levels of cow urine. The maximum grain yield of 18.6 q ha⁻¹ was recorded with the application of cow urine as compared with control. Sharma *et al.* (2016) [4] concluded that the application of 150 kg N ha⁻¹ through foliar sprays of cow urine reported significantly highest biological yield (36.7 t ha⁻¹) in broccoli. Veerasha *et al.* (2014) [5] reported that application of FYM 12.5 t ha⁻¹ + cattle urine at 34,300 l ha⁻¹ recorded significantly higher net returns (Rs. 34,425) and Kulkarni and Ahmed (2018) [2] concluded on the basis of pooled data for two years that cow urine foliar spray @ 5% at 30-45 DAS recorded the higher net returns (Rs. 31,618 ha⁻¹) followed by foliar spray of jeevamruth @ 5% (Rs. 31,072 ha⁻¹) when compared to control (Rs. 23,385 ha⁻¹) and other treatments.

Table 1: Mean Grain and stover yield, Cost of cultivation, gross and net monetary returns and benefit cost ratio of maize as influenced by different treatments.

Treatment	Grain yield (q ha ⁻¹)	Stover yield (q ha ⁻¹)	Cost of cultivation (Rs. ha ⁻¹)	Gross monetary returns (Rs. ha ⁻¹)	Net monetary returns (Rs. ha ⁻¹)	Benefit cost ratio
I. Nitrogen levels (N)						
N ₁ : 0% RDN	20.36	24.72	29900	50623	20723	1.69
N ₂ :50% RDN	24.82	27.54	31040	60661	29621	1.95
N ₃ :75% RDN	27.27	30.98	31698	66940	35242	2.11
N ₄ :100%RDN	31.49	33.36	32180	76335	44154	2.37
S.E. m.±	0.18	0.25	-	409	409	-
C.D. at 5%	0.52	0.72	-	1182	1182	-
II. Cattle urine levels (U)						
U ₁ : 0%	22.22	25.28	30755	54564	23809	1.77
U ₂ : 5%	24.36	27.61	31055	59775	28720	1.92
U ₃ : 10%	29.50	32.83	31355	72135	40780	2.30
U ₄ : 15%	27.86	30.88	31655	68086	36431	2.15
S.E. m.±	0.18	0.25	-	409	409	-
C.D. at 5%	0.52	0.72	-	1182	1182	-
III. Interaction						
S.E. m.±	0.36	0.50	-	818	818	-
C.D. at 5%	1.05	1.45	-	2364	2364	-
General mean	25.98	29.15	31205	63639	32435	2.03

Conclusion

From the economic point of view, it can be advocated that the application of 100% RDN i.e. 120 kg N ha⁻¹ and 10% foliar spray of cattle urine produced higher grain yield (31.49 and 29.50 q ha⁻¹) with the highest net monetary returns (44,154 and 40,780 ₹ ha⁻¹) and benefit cost ratio (2.37 and 2.30). The above conclusion, however, based on one season study. For confirmation the investigation needs to be repeated.

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