The Pharma Innovation Journal 2022; 11(2): 1246-1248

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 1246-1248

www.thepharmajournal.com
Received: 17-12-2021
Accepted: 29-01-2022

Lalita Verma
Department of Agronomy, Rajasthan Agricultural Research Institute, Durgapura, Jaipur, Rajasthan, India

Pradeep Kumar
Department of Agronomy, Rajasthan Agricultural Research Institute, Durgapura, Jaipur, Rajasthan, India

SS Shinde
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
Lalita Verma
Department of Agronomy, Rajasthan Agricultural Research Institute, Durgapura, Jaipur, Rajasthan, India

Effect of split application of nitrogen on economics of different treatments in *kharif* maize

Lalita Verma, Pradeep Kumar and SS Shinde

Abstract
Studies of split application strategy of nitrogen on the economics of the *kharif* maize is needed to enhance the nitrogen use efficiency. The field experiment was conducted at Cotton Research Station, Vasantrao Naik Marathwada Krishi Vidyapeeth, *Parbhani*. Dist. Parbhani during *Kharif* season of 2015 to evaluate the effect of split application of nitrogen on economics of *kharif* maize (*Zea mays* L.). The experiment was laid out in randomized block design with three replications. The treatment details of experiment factor comprised seven split application of nitrogen treatments *viz*.,100% Nitrogen at sowing (T_1), 75% N at sowing +25%N at 30 DAS (T_2), 50%N at sowing +50% N at 30 DAS (T_3), 25% N at sowing +75%N at 30 DAS (T_4), 25%N at sowing +50% N at 30 DAS + 25% at 60 DAS (T_5), 33%N at sowing + 33%N at 30 DAS + 33% at 60 DAS (T_6) and 25% N at sowing + 25%N at 30 DAS+25% at 60DAS +25% N at 60 DAS (T_7). The split application of nitrogen T_6 (33%N at sowing + 33%N at 30 DAS +33% at 60 DAS) produced significantly higher grain (2950 kg ha^{-1}), stover (6332 kg ha^{-1}) and biological (9282 kg ha^{-1}) yields as compared to others. Treatment T_6 also recorded significantly the highest gross returns (51014 ₹ ha^{-1}), net returns (30530 ₹ ha^{-1}) and B:C (2.49) ratio as compare to other treatments.

Keywords: Split application, nitrogen, economics of different treatments

Introduction

Many studies on split application and maize have been done, but most of the farmers don't use split application because farmers traditionally apply nitrogen to the soil in a single pass during either the fall or in the spring before planting. However, early nitrogen application can result in significant losses due to weather factors (e.g. warm, moist soils). Research has shown that a split application of nitrogen – one application in the fall or around the time of planting and a second application after planting when there is the greatest demand for N from the crop – can reduce total nitrogen use (savings to the farmer) and/or reduce nitrogen loss to the environment (savings to society). Split and delayed basal fertilizer applications are possible strategies to improve the crop yield and reduce nutrient loss through leaching in sandy soils, but their effectiveness under high rainfall regimes to produce a maize growth response needs further investigation. The primary purpose is to adjust the nitrogen supply according to the demand of a growing crop. This can improve nitrogen use efficiency. Split application reduces the risk of losses through leaching. Split application of nitrogen can increase grain yield and grain protein content. Split application is a N management strategy that will likely gain momentum in the next 5 to 10 years.

For the split application of nitrogen to be successful, the farmer has to make many decisions in the planning stage and specify the plans during the growing season. Split application is the process of matching nitrogen supply for a pre-established target yield and a given level of soil moisture, and then supplying the remaining nitrogen as moisture conditions improve. Split applications of nitrogen give producers greater flexibility in their fertilizer program. This practice minimizes the risk of placing all the nitrogen at the time of seeding. By providing nitrogen to meet the changing demands of a growing crop, producers can potentially increase nitrogen use efficiency. Split application reduces the exposure of nitrogen in saturated soils where the potential for losses such as leaching and denitrification are increased. It also reduces the amount of product a producer must handle during the busy seeding period. Finally, proper timing and placement of nitrogen may help reduce nitrous oxide emissions. Split application of nitrogen fertilizer may substantially improve corn nitrogen use efficiency, particularly durin wet growing seasons.

Corn shows large responses to nitrogen (N) fertilizer application, depending on weather, soil characteristics, water supply, crop uniformity and the nutrient responses of the cultivated varieties. Globally, maize is known as “Queen” of cereals because it has the highest genetic yield potential among the cereals. Maize is also known as Drosophila of crops. It efficiently utilizes solar energy and has immence potential for higher yield, so called as “Miracle crop”. Maize ranks third in India in terms of production among cereals. Split application of nitrogen is one of the methods to improve nitrogen use by the crop while reducing the nutrient loss through leaching and volatilization (Tolessa *et al.*, 1994) [11]. Split-application is an essential approach to increase the N use efficiency in crops including maize (Muthukumar *et al*., 2007) [2]. It improves the maize grain yield and increased the economic benefit from increased grain yield.

Materials and Methods

The experiment was conducted at Cotton Research Scheme, VNMKV, Parbhani during 2015-16. The soil was medium deep black and well drained. The topography of the experimental field was fairly uniform and levelled. Soil samples up to 30 cm were randomly collected from different locations of field before starts of the experiments during *Kharif* -2015 and a composite soil sample was prepared and analyzed for various physicochemical properties of the soil. The soil was clayey in texture with low in available nitrogen (165.9kg/ha), medium in available phosphorus (12.2 kg//ha) and high in available potassium (387.30kg/ha). The soil pH, organic carbon and electrical conductivity were 7.86, 0.70% and 0.48 ds/m, respectively. Geographically Parbhani is situated at 19o16’ North latitude and 76o47’ East longitude and at 409 altitude above sea level in Marathwada division encompassed by 17o35’ to 24o40’ North latitude and 74o49’ to 78o15’ East longitude geographical boundaries. Parbhani comes under subtropical climate.

Fertilizer Application

The dose of the NPK for maize was worked out according to the present recommendation of Kargil (900M) on state level. The 100% NPK dose in kg ha^{-1} worked out was 100:75:75 for maize crop.

Sources of Nutrients

The sources used for applying N, P and K were urea, single super phosphate (adjusted for its N content) and muriate of potash, respectively.

Treatment Application

Fertilizer application was made as per the treatments. Full dose of phosphorus and potash were applied at sowing as basal application.

Seed rate and sowing

Maize variety Kargil (900M) hybrid (Monsanto Company) was sown at the seed rate of 20 kg ha^{-1} at inter row of 60 and plant to plant spacing of 30 cm. Shallow furrows were opened and seeds were sown manually at the depth of 5 cm.

Yield Studies

Fodder yield (Kg ha^{-1})

After removal of cobs, the weight of plants from each net plot were recorded treatment wise separately.

Cob yield (Kg ha^{-1})

The total weight of fresh cobs per plant at harvest was recorded separately and calculated as cob yield on hectare basis.

Statistical analysis

The experimental data were subjected to statistical test by following Analysis of Variance Technique suggested by Panse and Sukhatme (1967) where, variance ratio (‘F’ value) was significant, critical difference (CD) values at 5% level of probability were computed for making treatment comparisons.

Economics

Gross monetary returns

On the basis of results obtained from the field experiment and prevailing market rates, the economics of various treatments were worked out.

The gross monetary returns (₹ ha^{-1}) influenced due to different treatments in the present study were worked out by considering market prices of economic product, by product and crop residues during the experimental year.

Cost of cultivation

The cost of cultivation (₹ ha^{-1}) of each treatment was worked out by considering the price of inputs, charges for cultivation, labour, land and other charges.

Net monetary returns

The net monetary returns (₹ ha^{-1}) of each treatment were worked out by deducting the mean cost of cultivation (Rs ha^{-1}) of each treatment from the gross monetary returns (₹ ha^{-1}) gained from the respective treatments.

Benefit: cost ratio

The benefit: cost ratio of each treatment was calculated by dividing the gross monetary returns by the mean cost of cultivation.

Results and Discussion

Results on economics, yield and quality of maize as influenced by various treatments.

Effect of split application of nitrogen on total dry matter production: At 45 DAS the total dry matter production was increased by 22.27 due to split application of nitrogen i.e. T_6 (33%N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing.

At harvest the dry matter production was increased by 38.42 due to split application of nitrogen i.e. T_6 (33%N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing.

The total dry matter production increased continuously up to harvest. Dry matter production in between 45 DAS to at 60 DAS indicating growth period was 71.90 percent of maximum in T_6 (33%N at sowing + 33%N at 30 DAS + 33% at 60 DAS).

It was 29.95, 32.75 and 34.81 per cent of maximum at 60, 75, 90 DAS, respectively. It also confirms the findings of several researchers like Harikrishna and Patil (2005) [2].

Effect of split application of nitrogen on cob weight per plant: The cob weight per plant was increased by 46.90

percent due to split application of nitrogen i.e. T_6 (33% N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing. Maximum weight per cob was observed in the application of nitrogen fertilizer in three splits. These results are in conformity with those recorded by Joshi *et al*. (2014) [4].

Effect of split application of nitrogen on grain yield

The grain yield was increased by 29.72 percent due to split application of nitrogen i.e. T_6 (33% N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing.

Maximum grain yield was observed in the application of nitrogen fertilizer in three splits. These results are in conformity with those recorded by Joshi *et al*., (2014) [4]. It also confirms the findings of several researchers like Rizwan *et al.* (2002) [8]. Rizwan found the highest grain yield with the application of three splits. These results also recorded by Nemati and Sharif (2012) [7]. Similar results was found by Sitthaphanit *et al*., (2010) [9], Tadesse *et al*. (2013) [10], and Amanullah *et al*. (2009) [1].

Effect of split application of nitrogen on stover yields

The stover yield was increased by 27.47 percent due to split application of nitrogen i.e. T_6 (33% N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing. Higher stover yield was observed in the application of nitrogen fertilizer in three splits. These results are in conformity with those recorded by Joshi *et al*. (2014) [4].

Effect of split application of nitrogen on biological yield

The biological yield was increased by 28.19 percent due to split application of nitrogen i.e. T_6 (33% N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing. These results are in conformity with those recorded by Iqbal *et al*. (2014) [3].

Effect of treatments on economics

Effect of split application of nitrogen on Gross monetary return

The Gross monetary return was increased by 29.17 percent due to split application of nitrogen i.e. T_6 (33% N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing. Similar results was found by Tadesse *et al.* (2013) [10].

Effect of split application of nitrogen on net monetary return

The net monetary return was increased by 42.84 percent due to split application of nitrogen i.e. T_6 (33% N at sowing + 33%N at 30 DAS + 33% at 60 DAS) over treatment T_1 i.e.100% nitrogen at the time of sowing. The result also confirms the findings of Tadesse *et al*. (2013) [10].

Effect of split application of nitrogen on Benefit: Cost Ratio

The split application of nitrogen i.e.T6 33% N at sowing + 33%N at 30 DAS + 33% at 60 DAS recorded higher B:C ratio (2.49) followed by T5, T7, T4, T3 treatments over T1 i.e. 100% nitrogen at the time of sowing (1.93). This finding confirms to those reported by Kumar *et al*. (2014) [5].

Acknowledgement

The author is thankful to Dr. B.V.Asewar, Chief scientist of dryland agriculture, Parbhani for providing facilities required for conducting the above experiment.

References

1. Amanullah. Partitioning of dry matter and grain yield potential in maize (*Zea may* L.) as influenced by plant density, rate and timing of nitrogen application. Int. J Sustain. Crop Prod. 2007;2(5):01-07.
2. Harikrishna BL, Dasog GS, Patil PL. Effect of soil depth and nitrogen application on yield attributes of maize and its economic analysis. Karnataka J Agric. Sci. 2005;18(2):370-374.
3. Iqbal S, Khan HZ, Ehsanullah1 N Akbar, Zamir MSI, Javeed HMR. Nitrogen management studies in maize (*Zea mays* l.) hybrids. Cercetări Agronomice În Moldova. 2013; 3:155.
4. Joshi A, Gupta JK, Choudhary SK, Paliwal DK. Efficiency of different Nitrogen Source, doses and Split application on growth and yield of maize (*Zea mays* L.) in the Malwa region of Madhya Pradesh. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS). 2014;7(2):39-42.
5. Kumar S, Verma PK, Tripathi AK. Effect of nitrogen management on yield and economics baby corn (*Zea mays*) grown in rabi season. Environment and Ecology. 2014; 32(4B):1788-1792.
6. Muthukumar VB, Velayudham K, Thavaprakaash N. Plant Growth Regulators and Split Application of Nitrogen Improves the Quality Parameters and Green Cob Yield of Baby Corn (*Zea mays* L.). J Agron. 2007;6(1):208-211.
7. Nemati AR, Sharifi RS. Effects of rates and nitrogen application timing on yield, agronomic characterstics and nitrogen use efficiency in corn. International Journal of Agriculture and Crop Sciences, 2012.
8. Rizwan M, Maqsood M, Rafiq M, Saeed M,† Ali Z. Maize (*Zea mays* L.) Response to Split application of Nitrogen. International journal of agriculture and biology. 2003, 1560–8530.
9. Sitthaphanit S, Limpinuntana V, Toomsan1 B, Panchaban1 S, Bell RW. Growth and Yield Responses in Maize to Split and Delayed Fertilizer Applications on Sandy Soils Under High Rainfall Regimes. Kasetsart J. (Nat. Sci.). 2010; 44:991–1003.
10. Tadesse T, Assefa A, Liben M, Tadesse Z. Effects of nitrogen split-application on productivity, nitrogen use efficiency and economic benefits of maize production in Ethiopia. International Journal of Agricultural Policy and Research. 2013;1(4):109-115.
11. Tolessa D, Gemechu G, Melakeselam L. Response of Maize to Split Application of Nitrogen Fertilizer at Bako. In: CSSE (Crop Science Society of Ethiopia). Sebil. Proceedings of the Sixth Annual Conference. Addis Abeba, Ethiopia. 1994;6:56-60.