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Effect of de-topping and nitrogen doses on economics of maize (*Zea mays* L.) Varieties

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Abstract

The experiment was conducted at research Farm, Indira Gandhi Agriculture=University, Raipur (C.G.) during *Kharif* 2018 to study the effect of de-topping and nitrogen levels on economics of maize (*Zea mays* L.) with two maize varieties (African tall and hybrid 25K55) practicing de-topping and no de-topping in main plots and four nitrogen levels in sub plot under split plot design and replicated thrice. The results of experiment on response of de-topping and nitrogen levels revealed that the minimum cost of cultivation Rs 31725 without de-topping in African tall, maximum gross return Rs ha⁻¹ was found in African tall with de-topping Rs 85478 and maximum net return Rs 53537 and B:C ratio 2.65 was recorded highest when no de-topping was done in African tall. Similarly, all these characters were also superior under treatment receiving 150 kg N ha⁻¹. The least value was obtained in unfertilized treatment.

Keywords: Topping, de-topping, nitrogen levels

Introduction

Maize (*Zea mays* L.) popularly known as corn or *makka* is one of the important cereal crops in world agriculture economy both as food for man and feed for animals. Maize is one of the most versatile crop with wide adaptability in agro-ecologies with maximum biomass production ability in short duration. It has highest genetic potential among food grains crops. In India maize is third most important food crop after rice and wheat in addition to staple food for humans and feed for animals. Among non-legumes fodders, maize is good source of starch, neutral detergent fibre (38-41%), acid detergent fibres (23-25%), lipid (5% oils), crude-protein (8-10%) therefore considered as energy efficient crop for livestock.

It is a C₄ plant, having high fodder production ability in short duration of time. Maize is cultivated through the year in different parts of country for various purpose including grain, baby corn fodder, green cobs, pop corn *etc.* In India maize is grown in 9.5 million hectare area with production of 26.63 million tones. In Chhattisgarh it is cultivated in 226.79 hectare area with an average yield of 2458 kg ha⁻¹. Its cultivation is confined to Ambikapur, Jashpur, Bilaspur, Raigarh, Raipur, Durg, Kanker, Jagdalpur and Dantewada districts of Chhattisgarh.

It is an important crop to develop standard agronomic practices to get maximum productivity. De-topping is one such culture operation practiced by maize growers. De-topping is such a cultural practice in which the apical or terminal portion of plant is removed from nodes above cobs *i.e.* leaving one or two leaves with aim to increase yield by controlling lodging, increasing light interception, increasing nutrient uptake, diverting plant nutrient to developing reproductive part (cobs) which in turn improves source to sink efficiency and resulting better cobs development.

Hence the present study was carried out with an objective to study the effect of de-topping and nitrogen levels on yield of maize (varieties).

Material and Methods

The experiment was conducted during kharif, 2018 at Instructional cum Research farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalay, Raipur (C.G.) with proper irrigation and drainage facilities. The institute is situated at Raipur in the central part of Chhattisgarh, climatologically known as "Chhattisgarh Plains" and geographically farm lies in between 21° 16' N latitude and 81° 26' E longitude at altitude of 289.56 meters above the mean sea level (MSL), and falls under central plateau.

According to soil analysis, the soil of the experimental site was sandy loam in texture. The soil was neutral in reaction pH (7.8) with electrical conductivity (EC) in the safer range (0.21 dSm⁻¹), low in organic carbon (0.58%) and available N (229.5 kg ha⁻¹) but medium in available phosphorus (16.3 kg ha⁻¹) and medium in potassium (272.02 kg ha⁻¹). A uniform dose of P₂O₅ (50 kg ha⁻¹) and K₂O (40 kg ha⁻¹) were applied in Single super phosphate (SSP) and muriate of potash (MOP), respectively and nitrogen was applied in three splits, 40% at basal, 30% at knee high stage and 30% at tasseling stage was scheduled through urea. The experiment was laid out in split plot design with three replications and comprising sixteen treatment combinations with de-topping & no-de-topping in maize varieties in main plots and four nitrogen levels 0, 50 kg, 100 kg, and 150 kg N ha⁻¹ in sub plots with 2.7 x 3 m net plot area.

Result and Discussion

Cost of cultivation

The cost of cultivation African tall with de-topping, was Rs 35475 and without de-topping was Rs 31725. However, the cost of cultivation in hybrid 25K55 was Rs 38255 with de-topping and Rs 34535 without de-topping. Similar results are even recorded by Manju Bhargavi *et al.* (2017)

Among nitrogen levels, minimum cost of cultivation was with control plot (Rs 30396 ha⁻¹) which is increase by increasing application of nitrogen being highest under 150 kg N ha⁻¹ (Rs 37193 ha⁻¹).

Table 1: Cost of cultivation as influenced by de-topping and nitrogen levels

Treatments	Cost of cultivation	Gross return	Net return	B:C Ratio
Main plot: DT and No DT				
Fodder type: African tall				
D ₁ : No De -topping	31725	85262	53537	2.65
D ₂ : De-topping	35475	85478	50002	2.37
Grain type: Hybrid 25K55				
D ₃ : No De-topping	34535	79491	44955	2.26
D ₄ : De-topping	38285	78350	40065	2.01
S.Em ±		1692	1692	0.1
CD(P=0.05)		5853	5853	0.19
Sub plot: Nitrogen levels N (kg ha⁻¹)				
N ₁ : 0	30396	47626	17230	1.58
N ₂ : 50	35895	69744	33849	1.95
N ₃ : 100	36537	96252	59715	2.65
N ₄ : 150	37193	114959	77766	3.11
S.Em ±		1224	1224	0.04
CD(P=0.05)		3572	3572	0.11
Interaction DXN		NS	NS	NS

Gross return

Maximum gross return Rs ha⁻¹ was found in African tall with de-topping (Rs 85478) as as compare to no de-topping (Rs 85262) this may be due to the additional income from the de-topped portion as green fodder. Grain yield was found higher in hybrid variety 25K55 as compared to fodder variety African tall, But gross return was higher in fodder variety African tall this may be due to high rate of fodder maize seed as compared to grain of hybrid 25K55, varied nitrogen levels increases the gross return as higher return is registered in 150 kg N ha⁻¹ (Rs 114959 ha⁻¹). The interaction effect of de-topping and nitrogen levels showed non-significant effect on gross return.

Net monetary returns (NMR)

Net income from investigation after deducting all expenses from the gross income generated by investment is net monetary returns. The net monetary return (NMR) varied due to de-topping and nitrogen levels. Net monetary return was found maximum with fodder variety (Rs 50002) the difference between de-topping and no de-topping was (Rs 3535) which was higher in no de-topping this may be due to labor cost of de-topping. Net monetary return was less in hybrid variety 25K55 as compared to fodder variety due to high demand and unavailability of fodder maize seed African tall gives better seed cost in market.

Varied nitrogen levels increases the net monetary return due to increase in marketable grain yield. The higher net return was registered with application of 150 kg N ha⁻¹ (Rs 77766 ha⁻¹). However, minimum net return (Rs 17230) was registered in control plot with no nitrogen application due to minimum grain and straw yield. The interaction effect of de-topping and nitrogen levels showed non-significant on net return.

Benefit cost ratio

Benefit cost ratio invested is an indication that attempts to summarize the overall value for money of a project it is the ratio of benefits received in terms of money. It is clear from the data presented in Table.1 that benefit cost ratio invested differ due to de-topping and no de-topping the maximum B:C ratio (2.6) was recorded in fodder variety with no de-topping as compare to other main plot treatments. De-topping and no de-topping show marginal difference in both the variety in regards to the benefit cost ratio invested. This may be due to additional fodder yield obtain from de-topping treatment. Similar results were observed by Emran *et al.* (2014) [4].

Higher monetary return per rupees invested was found in fodder variety African tall as compare to hybrid variety. The market value of green fodder and fodder seed are always high as compare to hybrid seed. Monetary return was found almost similar in de-topping and no de-topping practices. But in de-topping farmer can obtain additional green fodder by cutting the upper portion just above the cob.

Among various nitrogen levels 150 kg N ha⁻¹ recorded significantly maximum benefit cost ratio invested (3.11) as compare to other treatments. However, the minimum benefit cost ratio invested was recorded in unfertilized treatment (1.58) due to lowest grain and stover yield.

Conclusion

The findings of response of de-topping and nitrogen levels on economics of maize varieties, resulted that the maximum net monetary return (Rs 53537) was obtained from treatment no de-topping with African tall and the B:C ratio of no de-topping with African tall (2.65) which was at par with de-topping with African tall (2.37).

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