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Assessment of planting techniques on yield and economics of rabi maize in Diara area

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Abstract
The On-Farm Trial was conducted during *Rabi* season 2016-17 and 2017-18 for Assessment Of planting techniques On Yield and Economics Of Rabi Maize In Diara Area of Munger district on 06 farmers' fields with three planting distance *viz.* farmers practice (30 cm x20 cm row distance), planting distance - 40 cm x 20 cm, planting distance - 50 cm x 20 cm and planting distance - 60 cm x 20 cm and was randomly conducted in 06 farmers' fields and crops are grown with all the recommended packages of practices of rabi maize. Sowing of hybrid rabi maize on 50 cm x 20 cm planting row spacing was recorded significantly higher grain yield (79.4 q/ ha and 75.3 q/ ha) and dry fodder (144.1 q/ ha and 141.6 /ha),biological yield (223.4 and 216.91qt/ ha), plant height (240.1 and 237.3 cm), number of grain row per cob (18.3 and17.3), cob length (18.7 and 16.5 cm), 1000 grain weight (274 and 272.3 g) number of grain row per cob (37.3 and 36.5) and maximum cob weight (331.67 and 328.67g) over farmers practice and during both the years. However, the highest gross return (Rs.114748 / ha and 109240/ha), net return of (Rs.70982 /ha and 68220 /ha) and B: C ratio (3.69 and 3.41) was obtained with sowing of hybrid rabi maize under 50 cm x 20 cm row spacing of over farmers practice, 40 cm x 20 cm row distance, and 60 cm x 20 cm row spacing during both the years in diara area of Munger.

Keywords: Planting distance, productivity and economics, rabi maize

Introduction
Maize (*Zea mays* L) is second place in grain that is used jointly in form of food stuff or fodder purpose, globally, maize is called 'queen of cereal' due to its maximum yield potential among the cereals. Grain is provides food component which are consumed in the form of starch, cornflakes and also glucose, this is also used as poultry feed in country. it serves basic raw material to thousands of industrial products like oil, starch, alcoholic beverages etc. in our country In India, it is grown throughout the year under cereal crop due to photo thermal in insensitive characters. Maize can cultivated in all types of soil as they requires well drained alluvial or simply red loams free of coarse element and full of nitrogen for ideal soil for maize cultivation. fertile and different chemicals. Maize can grow wide range of soil including loamy sand to clay loam soil. There are several factors that affect the productivity of winter maize; however, planting distance, balanced nutrition and weed management, sowing time, water and insect pest and diseases etc is most prominent factors and they plays a significant role in increasing crop production and its quality of maize. For the major processes of plant development and yield formation has occurred the presence of nutrient elements like N, P, K, S, Mg etc. for maize crop. Maize crop is more nutrient exhaustive crop and sown in wider row spacing and optimum planting distance obtained poor grain yield. However, most of farmers are planted maize crop in narrow row distance resulted in low productivity and profitability due to more number of plant population, thinner plant, poor growth, smaller cob and gave improper grain filling in cob at farmers' fields. Keeping the above point in views and strategies made for conducting On-farm trial at farmers field with respect to assessment of planting distance on productivity of Rabi maize in diara area and aims to assess optimum planting row spacing for higher productivity and profitability of maize.

Objectives

1. To assess suitable planting distance of Rabi maize for higher productivity under Diara area
2. To assess appropriate planting distance for higher net returns of Rabi maize.
3. To assess suitable B:C ratio under optimum planting distance of Rabi maize.

Materials and methods

The On-farm trial study was conducted during *Rabi* seasons of 2016-17 and 2017-18 for "Assessment Of planting techniques On Yield and Economics of Rabi Maize in Diara Area at farmers' fields of Bahachowki (Dharahara block) and Farda (Jamalpur block) villages of Munger district. The field survey was conducted in selected progressive farmers of maize grown areas of the villages in the district on the basis of participatory field survey and problem was identified in farmers' fields in rabi maize crop. They have applied higher seed rate and sown crop in narrow row spacing under 30 cm x 20 cm. For this reason on-farm trial was conducted with farmers practices and three planting distance or practices i.e. farmers practice (30 cm x20 cm row distance). planting distance 40 cm x 20 cm, planting distance - 50 cm x 20 cm and planting distance - 60 cm x 20 cm and was randomly demonstrated in 06 farmers' fields with randomized block design in both villages of different crop growing seasons. The soil of the experimental plot was analyzed by standard procedures (Black, 1965) [2]. Soil was clay loam to silty clay loam, having pH 6.8-7.7, rich in organic carbon 0.42 to 0.58, medium in available P_2O_5 (20.1 to 25.6 kg /ha) and available K_2O (191.5 to 208.3 kg /ha) in irrigated situation of diara area of Munger district. Data on growth, yield and yield attributes and economics were recorded and data analyzed with suitable statistical methods (Sukhatme and Panse, 1967) [7] to compare yield of farmers practice and on-farm trial technical option plots.

Effect of planting distance on growth and yield attributes:

The growth and yield attributes *viz*, cob length, number of grain row per cob, 1000-grain weight(g) and number of grains per row and weight per cob of rabi maize was significantly recorded among the technical options and farmers practice (Table 1). Significant highest plant height (240.1 and 237.3 cm), number of grain row per cob (18.3 and17.3), cob length (18.7 and 16.5 cm), 1000 grain weight (274 and 272.3g) was recorded with planting distance of 50 cm x 20 cm in rabi maize but it was at par with planting distance of 40 cm x 20 cm over farmers practice (200.2 and 196.2 cm). However, non-significant difference was observed in plant height, number of grain row per cob, grain weight of rabi maize with planting distance of 60 cm x 20 cm and farmers practices (30 cm X 20 cm). The maximum number of grain row per cob (37.3 and 36.5) was noticed with planting distance of 50 cm x 20 cm in rabi maize followed by planting distance of 40 cm x 20 cm and but at par with planting of 60 cm x 20 cm superior over farmers practice. The significant maximum cob weight (331.67 and 328.67g) was resulted with planting distance of 50 cm x 20 cm in rabi maize followed by planting distance of 40 cm x 20 cm and but at par with planting of 60 cm x 20 cm superior over farmers practice. The planting distance of 50 cm x 20 cm was obtained higher grain yield due to more contribution of photosynthetes source to sink in grain formation in cob which is resulted proper supply of nutrients, water, light, and air during vegetative stage to grain development stage through optimum planting distance of 50 cm X 20 cm in rabi maize. The results were conformity with the findings of Rewathi *et al*. (2017) [4] and Mohammad *et al*. (2001) [6].

Effect of planting distance on grain yield dry fodder and biological yield

The grain yield, dry fodder yield and biological yield in rabi maize was significantly differed among the among planting distance and farmers practice (Table 1). Significantly highest grain yield (79.3 and 75.31q/ha) and stover or dry fodder yield (144.1 and 141.6 q/ha) and biological yield (223.4 and 216.91qt/ ha) was recorded with planting distance of 50 cm x 20 cm in rabi maize but it was at par with planting distance of 40 cm x 20 cm over farmers practice. However, non-significant difference was observed in grain yield, dry fodder yield and biological yield in rabi maize with planting distance of 60 cm x 20 cm and farmers practices (30 cm X 20 cm). The planting distance of 50 cm x 20 cm was obtained higher grain yield, dry fodder yield and biological yield in rabi maize due to resulted in more leaf area index, number green leaves, plant height on growth and development phase and more translocation of photosynthetes from source to sink under grain formation in cob which is resulted proper supply of nutrients, water, light, and air during vegetative stage to grain formation stage through optimum planting distance of 50 cm X 20 cm in rabi maize. These results were conformity with the findings of Bangrawa *et al*., (1989) [3] and Mohammad *et al*. (2001) [6].

Effect of planting distance on economics

The result indicated (Table 2) that maximum cost of cultivation of rabi maize was recorded with farmers practice (Rs.32940 ha^{-1} and Rs.35120 ha^{-1}) over technological options in both seasons. The Highest gross return (Rs. 114748/ha and Rs.109240 ha^{-1}) and net return (Rs. 83694/ha and Rs.76816 ha^{-1}) was obtained with technological options 2 planting distance of 50 cm X 20 cm (technical option 2) over farmers practice (Rs. 83476 $ha^{-1}$and Rs. 75723 ha^{-1}) and other technological potions of rabi maize in both seasons in diara area maize in diara area. However, maximum B:C ratio(3.69) was recorded with planting distance of 50cn X 20 cm followed by row spacing of 40 cm X 20 cm and row spacing of 60 cm X 20 cm and farmer practice (30 cm X 20 cm) of B:C ratio 2.53. Thus. Result indicated that optimum planting of 50 cm x 20 cm is better option to get maximum beneficial to the farmers for higher productivity and profitability of rabi maize in diara area. The results were conformity with the findings of Rewathi *et al*. (2017) [4] and Dawadi and Sah (2012) [5], and Ann, (2015) [1].

Table 1: Effect of planting distance on growth, yield, and yield attributes of Rabi Maize in diara area

Technology option	Grain yield (qt/ha)		Stover yield (qt/ha)		Biological yield (qt/ha)		Plant height(cm)		Grain row per cob		No. of Grains per row		Cob length (cm)		Cob weight (g)		1000 Grain weight (g)	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Farmers practice (30 cm x 20 cm)	57.78	51.59	104.5	99.53	162.3	151.1	200.2	196.2	12.3	11.8	24.7	23.8	14.6	13.9	276.7	27.2	222.8	222.0
Planting distance (40	71.5	66.5	125.7	120.4	197.2	186.9	216.0	215.2	16.0	15.5	31.5	30.5	17.4	16.5	307.0	303.8	256.7	225.8

cmx20 cm)																		
Planting distance (50 cmx20 cm)	79.30	75.31	144.1	141.6	223.4	216.91	240.1	237.3	18.3	17.3	37.3	36.5	18.7	17.6	331.7	328.6	274.0	272.3
Planting distance (60 cmx20 cm)	66.70	64.93	120.5	114.7	187.2	179.63	213.2	211.0	14.0	13.5	29.7	28.7	16.1	15.2	305.2	302.7	243.0	242.7
S Em ±	4.15	4.43	6.61	5.82	10.76	10.25	8.31	8.60	1.17	1.09	1.21	1.44	0.57	0.54	6.67	7.03	9.94	9.12
CD (P=0.05)	12.69	13.48	20.12	17.71	32.81	31.19	25.27	26.15	3.55	3.30	3.67	4.38	1.75	1.65	21.19	21.38	28.7	27.33

Table 2: Effect of planting distance on economics of Rabi Maize in diara area

Treatments/Technical options	Cost of cultivation (Rs./ha)		Gross return (Rs/ha)		Net return (Rs./ha)		B:C ratio	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Farmers practice (30 cm x 20 cm)	32990	35120	83476	75476	50486	40357	1.53	1.15
Planting distance (40 cm x 20 cm)	32022	34020	103004	96085	70982	62065	2.22	1.82
Planting distance (50 cm x 20 cm)	31054	33524	114748	109240	83694	75723	2.69	2.24
Planting distance (60 cm x 20 cm)	30870	33492	98417	93589	67647	60097	2.18	1.79

Conclusion

Thus, it can be concluded that planting of rabi maize with 50 cm x 20 cm row distance is more suitable and beneficial to obtain higher grain yield, net return and B: C ratio at farmers' fields in diara area of Munger.

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