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Response of Drip Fertigation, Intra Row Seeding of Legume and Planting Geometry on Net Return of Summer Maize

Minu Mohan*, A. L. Rathore and S. K. Jha

Department of Agronomy,

College of Agriculture, Raipur, Indira Gandhi Krishi Viswavidyalay, Raipur Chhattisgarh

*Corresponding Author E-mail: minumohansingh@yahoo.com

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ABSTRACT

Field experiment was conducted on Research farm, Indira Gandhi Krishi Vishwavidyalay Raipur during summer 2016 to study the response of drip fertigation intra row seeding of legume and planting geometry on soil health productivity and net return of summer maize. The experiment was laid in strip plot design with six vertical drip fertigation and intra row cowpea and three horizontal planting geometry with eighteen treatments. The results reveled that highest net return and B:C ratio was found in drip fertigation 125%RDF and planting geometry 60 x 20 cm.

Key words: *Drip fertigation, Planting geometry, Recommended fertilizer doze (RDF), B : C ratio, Net return.*

INTRODUCTION

Maize in India contributes nearly 9% of the national food basket and more than rupees 100 billion to the agriculture GDP apart from generating employment to over 100 million man-day at the farm and downstream agriculture and industrial sectors. The pressure for the most efficient use of water for agriculture is intensifying with the increased competition for water resources among various sectors with mushrooming population. In spite of having the largest irrigated area in the world, India too has started facing severe water scarcity in different regions. Normally with creation of water facility in Chhattisgarh and eastern India as well, farmer prefer to grow rice after harvest of *kharif* season rice. Summer rice requires huge quantity of water to meet out evapotranspiration and seepage percolation losses. Hemlata reported that summer rice require 9000-11000 litre water to produce one kilogram rice whereas this requirement for rainy season rice is reported to 4000-5000 litres. The summer rice can be substituted with summer maize. The yield potential of summer rice and maize is nearly equal but cost of cultivation and water requirement of summer rice is substantially higher than summer maize.

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But nutrient requirement of maize is too high that effect soil health in long run, if proper care will not be taken. Plant populations affect most growth parameters of maize even under optimal growth conditions and therefore it is considered a major factor determining the degree of competition between plants[5]. Optimum corn population is essential for maximum economic gain, as well better utilization of fertility, soil, water and climatic effects. The maize does not have the flexibility like most of crop species, which can increase leaf area and number of reproductive units by branching at low crop densities[3]. To make farming sustainable, intercropping is a very fruitful idea. Short duration vegetables grown in between the agricultural crops are the recent advancement to fulfil the requirement of vegetables without any reduction of agricultural area. Intercropping of legumes with corn is well compatible and profitable cropping system[6].

MATERIAL AND METHODS

Field experiment was conducted on Research farm, Indira Gandhi Krishi Vishwavidyalay, Raipur during summer 2016 to study the response of drip fertigation intra row seeding of legume and planting geometry on growth, yield attributes and yield of summer maize. The experiment was laid in strip plot design with six vertical drip fertigation and intra row cowpea and three horizontal planting geometry. Six fertigation and intra row cowpea treatments include (F1) Drip fertigation 100% RDF,(F2) Drip fertigation 125%RDF, (F3) Surface irrigation (furrow) 100%RDF, (F4) Drip fertigation 100 % RDF + intra row cowpea (F5) Drip fertigation 125% RDF + intra row cowpea (F6) Surface irrigation (furrow) 100%RDF + intra row cowpea and three horizontal treatments planting geometry include (S30) 30 x 20 cm, (S45) 45 X 20 cm, (S60) 60 x 20 cm. The RDF taken was 120 : 60 : 40 N : P_2O_5 :K_20 kg ha^{-1} . The climate of Raipur is dry sub-humid to semi-dry with maximum temperature of 46°C during summer and minimum temperature of 6°C during winter season. The soil of the experimental site was sandy loam. Maize MM2562 hybrid was taken as test crop. The furrows were opened at 20 cm apart and 2 seeds per hill were dibbled in furrows to a depth of 4 cm. After establishment of crop at 10 days of emergence, thinning was done by leaving one seedling per spot to maintain required plant density as per treatment. The come up irrigation was given just after planting. Irrigation treatments were imposed from 10 days after planting (DAP). Irrigation was scheduled according to the treatment. Five plants were selected at random and tagged these plants were used to record the growth, yield attributes and yield.

RESULT AND DISCUSSION

Grain yield

Significantly higher grain yield (59.12q ha^{-1}) was recorded in drip fertigation 125% RDF and cowpea which was at par with drip fertigation 100% RDF and cowpea (57.21 q ha^{-1}) and drip fertigation 125% RDF (56.92q ha^{-1}) while superior over rest of the treatments. Similarly planting geometry 60 x 20 c.m. was found to be the best grain yielding and was similar to planting geometry 45 x 20 c.m. Stover yield followed the same trend as of grain yield. Harvest index computed from grain and stover yield didn't differ significantly. It was inferred from the experiment that drip fertigation 125%RDF and cowpea with 60 x 20 cm planting geometry was best for purpose of grain yield.

Table 1: Grain and stover yield and harvest index of summer maize as influenced by fertigation and intra row legume and crop geometry

Treatments	Grain yield (q ha^{-1})	Stover yield (q ha^{-1})	Harvest Index (%)
Fertigation and intra row seeding			
F1: Drip Ferti.100% RDF	54.76	115.06	32.22
F2: Drip Ferti.125% RDF	56.92	124.24	31.26
F3: Furrow irri.100% RDF	42.28	92.41	31.43
F4: Drip Ferti. 100% RDF + cowpea	57.21	128.72	30.89
F5: Drip Ferti.125% RDF + cowpea	59.12	136.62	30.20
F6: Furrow irri. 100% RDF + cowpea	44.11	96.24	31.61
SEm ±	0.71	2.54	0.41
CD(P=0.05)	2.23	8.00	NS
Crop geometry (Row and plant spacing)			
S30: 30 cm x 20 cm	46.69	107.64	30.65
S45: 45 cm x 20 cm	54.19	116.66	32.02
S60: 60 cm x 20 cm	56.33	122.35	31.14
SEm±	0.58	4.27	1.06
CD(P=0.05)	2.30	NS	NS
Int (F X M)	S	NS	NS

Table 2: Interaction between fertigation & intra row seeding and crop geometry on yield (q ha^{-1}) of summer maize

Fertigation and intra row seeding	Crop geometry			
	S30	S45	S60	Mean
F1: Drip Ferti.100% RDF	49.98	51.28	63.01	54.76
F2: Drip Ferti.125% RDF	44.88	61.43	64.46	56.92
F3: Furrow irri.100% RDF	34.91	54.31	37.63	42.28
F4: Drip Ferti. 100% RDF + cowpea	52.65	55.94	63.04	57.21
F5: Drip Ferti.125% RDF + cowpea	54.93	52.97	69.44	59.12
F6: Furrow irri. 100% RDF + cowpea	42.77	49.19	40.38	44.11
Mean	46.69	54.19	56.33	
			SEm±	CD (P=0.05)
Two horizontal strip means at the same level of vertical strip			1.57	4.84
Two vertical strip means at the some lever of horizontal strip			0.49	1.48

Economics

Cost of cultivation was significantly highest in drip fertigation 125 %RDF and cowpea whereas lowest in Furrow irrigation 100 % RDF. Cost of cultivation enhanced due to input cost like fertilizer, drip irrigation system and addition of cowpea in drip fertigation with 125% RDF and cowpea. Variation in cost of cultivation of maize amongst different spacing was due to cost of seed and labour charges but it didn't differ significantly.

Significantly higher gross return (Rs.101186 ha^{-1}), net return (Rs. 63211 ha^{-1}) and benefit cost ration (Rs.1.66 Rs.$^{-1}$ invested) was recorded in drip fertigation with 125% RDF and cowpe which was found at par with drip fertigation with 125% RDF and drip fertigation with 100% RDF and cowpea. Gross and return and benefit cost ratio amongst crop geometry was significantly higher in wider spacing of 60 x 20 cm compared to 45 x 20 cm and 30 x 20 cm row spacing. It can be concluded that additional net benefits of 137 and 129% can be obtained by sowing the crop at 60 x 20 and 45 x 20 cm spacing compared to narrow spacing of 30 x 20 cm. The findings are in conformity of the results reported by Fanish *et al*[2].

Table 3: Influenced by fertigation and intra row legume and crop geometry on economic returns and benefit cost ration of summer maize

Treatments	Gross income (Rs.ha^{-1})	Cost of cultivation (Rs.ha^{-1})	Net income (Rs.ha^{-1})	Benefit cost ratio (Rs. Rs^{-1})
Fertigation and intra row seeding				
F1: Drip Ferti.100% RDF	92004	35841	56163	1.57
F2: Drip Ferti.125% RDF	96334	36398	59935	1.65
F3: Furrow irri.100% RDF	71574	28704	42870	1.50
F4: Drip Ferti. 100% RDF + cowpea	97405	37040	60364	1.63
F5: Drip Ferti.125% RDF + cowpea	101186	37975	63211	1.66
F6: Furrow irri. 100% RDF + cowpea	74649	30312	44337	1.47
SEm ±	1157	243	1185	0.04
CD(P=0.05)	3646	765	3734	0.12
Crop geometry				
S30: 30 cm x 20 cm	79876	34099	45777	1.33
S45: 45 cm x 20 cm	91462	34309	57154	1.69
S60: 60 cm x 20 cm	95237	34728	60509	1.72
SEm±	685	131	580	0.01
CD(P=0.05)	2690	NS	2278	0.05

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