



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(6): 963-966
Received: 12-09-2017
Accepted: 14-10-2017

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Agronomic management practices for promising groundnut cultivar RTNG-29 (*Konkan Bhuratna*)

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Abstract

A field experiment was conducted at Agricultural Research Station, Shirgaon, Dr. B.S. Konkan Krishi Vidyapeeth, Ratnagiri (MS) on the lateritic soil during Rabi 2015-16 to 2016-17 to study agronomic management practices for promising groundnut cultivar RTNG-29 (*Konkan Bhuratna*). The treatment comprises two main plot treatments of varieties, sub-plot treatments consists three spacing and sub-sub plot treatment consists three fertilizer management treatments replicated three times in split-split plot design. Groundnut cultivar, RTNG-29 (*Konkan Bhuratna*) sown with 30X10 cm plant spacing (plant population of 3,33,333 plants ha⁻¹) and fertilized with 30:70:00 NPK kg ha⁻¹ noticed significantly highest pod, kernel and haulm yield of groundnut, which was followed by RTNG-29 (*Konkan Bhuratna*) sown with 30X10 cm plant spacing (plant population of 3,33,333 plants ha⁻¹) and fertilized with 25:50:00 NPK kg ha⁻¹. But in terms of economics groundnut cultivar RTNG-29 (*Konkan Bhuratna*) sown with 30 X 10 cm plant spacing and fertilized with 25:50:00 NPK kg ha⁻¹ gives more benefit to cost ratio 2.08 with net returns of Rs 76561 ha⁻¹) as that of groundnut cultivar RTNG-29 (*Konkan Bhuratna*) sown with 30X10 cm plant spacing and fertilized with 30:70:00 NPK kg ha⁻¹ (net returns Rs 71880 ha⁻¹ and B:C ratio 2.02).

Keywords: Variety, Plant population, Fertilizer management, Dry pod yield and Economics

1. Introduction

Groundnut (*Arachis hypogaea* L.) is a major oilseed crop in India. Its seed contain high quality of 45-50% edible oil, 25-30% digestible protein, 20% carbohydrates, and 5% fiber and ash which make a sustainable contribution to human nutrition (Fageria *et al.*, 1997) [3]. Groundnut is considered as poor man's almond and also called as "King of oilseeds". It is cultivated in India over 45.97 million ha area with the production of 67.33 million tonnes (both *kharif* and *rabi*) and average productivity of 1.47 t ha⁻¹ (Indiastat, 2016) [6]. In Maharashtra, groundnut cultivated (both *kharif* and *rabi*) over an area of 3.09 million ha with production of 3.34 million tonnes having productivity of 1.08 t ha⁻¹ (Indiastat, 2016) [6]. The area under groundnut crop in konkan was about more than 15,000 ha with 1,550 kg ha⁻¹ productivity during 2013-14 (Anonymous, 2013) [1].

Planting geometry is an important agronomical management practice and non-monetary input, which has key role in increased crop production. Crop planted in appropriate geometry enhances use of natural resources as well as inputs given to the crop. Groundnut crop competes with each other above and below the ground. Planting geometry varies according to varieties, species and region. Similarly, appropriate fertilizer dose is also an important aspect regarding crop production. Supplying nutrients in required quantity and fulfills crop need, increases the potential of cultivar. Study of different levels of fertilizer to crop helps to standardize the fertilizer dose for getting profitable yield.

Groundnut variety RTNG-29 (*Konkan Bhuratna*) is promising and semi spreading variety developed by Agricultural Research Station, Shirgaon. It is cross of PBS 24030/GPBD 4, hybridization followed by pedigree selection breeding method. It is midlate duration (115-120 days), Virginia Bunch type groundnut culture having 2.5 to 3.0 t/ha average pod yield, suitable for both *kharif* and *rabi* seasons with 50.01 % oil content, 23.44% protein content and 74 % shelling percentages and medium bold kernel type. It is resistant to early and late leaf spot, rust, PBNB, alternaria leaf blight diseases and also resistant to thrips, jassids, leaf miner, defoliator insect and pests. It is released for commercial cultivation in upland area during *Kharif* and irrigated area during *Rabi* season in Konkan region of the Maharashtra state during 2017. Groundnut variety, Konkan Gaurav is promising, semi spreading and medium bold kernel type variety. This variety is popular among the farmers and taken as check in this experimentation. So therefore it is necessary to find appropriate planting geometry and fertilizer dose for getting profitable yield from promising cultivar, RTNG-29

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(*Konkan Bhuratna*) in comparison with popular variety Konkan Gaurav.

Materials and Methods

The present field investigation was undertaken at Agricultural Research Station, Dr. B.S. Konkan Krishi Vidyapeeth, Shirgaon, Dist. Ratnagiri (MS) during two consecutive *rabi* seasons of 2015-16 and 2016-17. The experiment was laid out in split-split plot design with eighteen treatment combinations replicated three times. Main plot treatment consists of two varieties *viz.*, promising ground nut cultivar V₁: RTNG-29 (*Konkan Bhuratna*) and check V₂: Konkan Gaurav. The sub plot consists three plant spacing *viz.*, S₁: 30 X 10 cm, S₂: 30 X 15 cm and S₃: 45 X 10 cm. However sub-sub plot consist three fertilizer doses, F₀: Control, F₁: 25:50:00 kg NPK ha⁻¹ and F₂: 30:70:00 kg NPK ha⁻¹. The experimental soil was sandy loam in texture with acidic in reaction (pH 5.5), low in available nitrogen (276.8 kg ha⁻¹), phosphorus (13.32 kg ha⁻¹) and medium in available potassium (184.59 kg ha⁻¹). All the treatments were imposed as per the schedule and statistical data of these variables obtained during the course of investigation were analyzed by analysis of variance method as per the procedure (Split plot design) described by Gomez and Gomez (1983) [4] and Panse and Sukhatme (1985) [10].

Result and Discussion

Effect of variety

The pooled results (Table 1) revealed that, promising groundnut cultivar, RTNG-29 (*Konkan Bhuratna*) recorded significantly higher pod, kernel and haulm yield (3052, 2208, 3553 kg ha⁻¹, respectively) over groundnut variety, Konkan Gaurav. The increment in pod yield with promising variety, RTNG-29 (*Konkan Bhuratna*) over variety Konkan Gaurav was in the tune of 28.61 %. In case of post harvest studies (Table 2), promising groundnut cultivar, RTNG-29 (*Konkan Bhuratna*) showed significantly higher 100 kernel weight than check, Konkan Gaurav. Whereas remaining attributes, *viz.*, total number of pods per plant, 100 dry pod weight did not attain significant difference due to varieties. These might be due to high yielding genetic character associated with promising cultivar, RTNG-29 (*Konkan Bhuratna*). Similar results were reported by Kamara *et al.* (2011) [7] and Bailey *et al.* (2000) [2] which said, it was as a result of inherent genetic variability and the ability of the plant to utilized nutrient in the soil effectively.

The highest net returns of Rs. 83,714/- with 2.10 B: C ratio was given by sowing crop using groundnut cultivar, RTNG-29 (Table 3).

Effect of Spacing

Pooled data (Table 1) insinuates that, groundnut crop sown at closer spacing of 30 X 10 cm given significantly highest dry pod, kernel and haulm yield as compared to rest of plant spacing of 30 X 15 cm and 45 X 10 cm. These might be due to more plant population associated with closer plant spacing. These results are in hormone with the findings of Haricharan Reddy *et al.* (2014) [5], Meena (2011) [8] and Morshed Alam *et al.* (2002) [9].

In terms of economics, groundnut crop sown at closer spacing of 30 X 10 cm given highest net returns of Rs. 88,336/- with B:C ratio of 2.08 (Table 3)..

Fertilizer management

Application fertilizer @ 30:70:00 NPK ha⁻¹ has noticed significantly higher pod, kernel and haulm yield of groundnut (3053 kg, 2223 kg and 3422 kg ha⁻¹, respectively) over control and closely followed by fertilizer management treatment @ 25:50:00 NPK ha⁻¹ (Table 1). In case of post harvest studies, application fertilizer @ 30:70:00 NPK ha⁻¹ gave significantly highest 100 dry pod weight over rest of fertilizer management treatments (Table 2). Application of N and P fertilizers influences the yield of the crop. Fertilizers promotes vegetative as well as root growth and increases the yield of groundnut (Jakusko and Dakato, 2015). Dadson and Petkov (1976) reported that the high application of nitrogen application is required for high yield of the crop.

In respect of economics, maximum benefit was obtained by application of fertilizer treatment @ 25:50:00 NPK ha⁻¹ having benefit to cost ratio of 2.08 and net returns of Rs.76561/-, which was followed by application of fertilizer @ 30:70:00 NPK ha⁻¹ having B:C ratio of 2.02 and net returns of Rs. 81,212/- (Table 3).

Interaction effect

The interaction effect between variety, spacing and fertilizer management was found to be significant for pod, kernel and haulm yield of groundnut (Table 1.1, 1.2 and 1.3). The promising groundnut cultivar RTGN-29 (*Konkan Bhuratna*) sown at closer spacing of 30 X 10 cm with application of fertilizer @ 30:70:00 NPK ha⁻¹ recorded significantly higher pod, kernel and haulm yield (2805, 2007, 2968 kg ha⁻¹) over rest of treatment combinations followed by promising groundnut cultivar RTGN-29 (*Konkan Bhuratna*) sown at closer spacing of 30 X 10 cm with application of fertilizer @ 25:50:00 NPK ha⁻¹.

Table 1: Dry pod, kernel and haulm yield of groundnut at harvest as influenced by different treatments (pooled data)

Treatments	Dry Pod yield (kg ha ⁻¹)	Kernel yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
Variety (V)			
V1: RTNG-29	3051.5	2208.1	3553.2
V2: Konkan Gaurav	2372.7	1720.7	2757.8
SEm	115.7	79.0	55.3
CD at 5%	454.4	310.2	217.2
Spacing (S)			
S1: 30 X 10 cm	3245.4	2326.7	3532.1
S2: 30 X 15 cm	2497.7	1816.8	2960.5
S3: 45 X 10 cm	2393.2	1749.7	2973.8
SEm	88.1	65.9	57.7
CD at 5%	264.0	197.6	173.0
Fertilizer doses (F)			
F ₀ : Control	2280.4	1638.2	2833.8
F ₁ : 25:50:00 kg NPK ha ⁻¹	2803.0	2032.1	3210.1

F ₂ : 30:70:00 kg NPK ha ⁻¹	3052.8	2222.8	3422.4
SEm	4.4	3.4	3.8
CD at 5%	12.2	9.4	10.5
Interactions			
V x S	NS	NS	NS
V X F	17.2	13.3	14.8
S x F	21.1	16.3	18.1
V x S x F	29.8	23.0	25.7
CV (A)	31.4	29.6	12.9
CV (B)	19.5	20.1	11.0
CV (C)	1.0	1.0	0.7

Table 1.1: Dry pod yield, kernel yield and haulm yield of groundnut as influenced by interaction effect between variety and fertilizer management (Pooled data)

Treatments	Dry pod yield (kg ha ⁻¹)				Kernel yield (kg ha ⁻¹)				Haulm yield (kg ha ⁻¹)			
	F ₀	F ₁	F ₂	Mean	F ₀	F ₁	F ₂	Mean	F ₀	F ₁	F ₂	Mean
V ₁	2544	3185	3425	3051	1833	2293	2498	2208	3208	3633	3818	3553
V ₂	2017	2421	2680	2373	1443	1771	1948	1721	2460	2787	3027	2758
Mean	2280	2803	3053	2712	1638	2032	2223	1964	2834	3210	3422	3155
Comp. Mean	S.E. +		LSD (0.05)		S.E. +		LSD (0.05)		S.E. +		LSD (0.05)	
Variety (S)	115.7		454.4		79		310.2		55.3		217.2	
Fert. Dose (F)	4.4		12.2		3.4		9.4		3.8		10.5	
Int. SX F	6.21		17.2		4.79		13.3		5.34		14.8	
C.V. (V and F)	31.36		0.97		29.56		1.03		12.9		0.7	

Table 1.2: Dry pod yield, kernel yield and haulm yield of groundnut as influenced by interaction effect between spacing and fertilizer management (Pooled data)

Treatments	Dry pod yield (kg ha ⁻¹)				Kernel yield (kg ha ⁻¹)				Haulm yield (kg ha ⁻¹)			
	S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean
F ₀	1727	1438	1396	2280	1234	1000	1042	1638	1968	1786	1914	2834
F ₁	2230	1696	1680	2803	1605	1251	1208	2032	2417	2009	1994	3210
F ₂	2534	1862	1710	3053	1814	1382	1250	2223	2679	2127	2039	3422
Mean	3245	2498	2393	1808	2327	1817	1750	1310	3532	2961	2974	2104
Comp. Mean	S.E. +		LSD (0.05)		S.E. +		LSD (0.05)		S.E. +		LSD (0.05)	
Spacing (S)	88.1		264.0		65.9		197.6		57.7		173.0	
Fert. Dose (F)	4.4		12.2		3.4		9.4		3.8		10.5	
Int. SX F	7.61		21.09		5.87		16.3		6.54		18.14	
C.V. (S and F)	19.49		0.97		20.13		1.03		10.97		0.72	

Table 1.3: Dry pod yield, kernel yield and haulm yield of groundnut as influenced by interaction effect between variety, spacing and fertilizer management (Pooled data)

Treatments		Dry pod yield (kg ha ⁻¹)				Kernel yield (kg ha ⁻¹)				Haulm yield (kg ha ⁻¹)			
		S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean
V ₁	F ₀	1846	1541	1701	1696	1341	1028	1297	1222	2126	1987	2304	2139
	F ₁	2618	2068	1683	2123	1893	1511	1182	1529	2718	2399	2149	2422
	F ₂	2805	2134	1912	2284	2007	1609	1380	1665	2968	2372	2297	2546
V ₂	F ₀	1608	1334	1091	1345	1127	973	787	962	1810	1585	1525	1640
	F ₁	1841	1324	1677	1614	1318	992	1233	1181	2116	1618	1840	1858
	F ₂	2263	1589	1508	1787	1621	1155	1119	1298	2391	1881	1781	2018
Mean		3245	2498	2393	1808	2327	1817	1750	1310	3532	2355	1974	1983
Comp. Mean		S.E. +		LSD (0.05)		S.E. +		LSD (0.05)		S.E. +		LSD (0.05)	
Variety (V)		115.7		454.4		79		310.2		55.3		217.2	
Spacing (S)		88.1		264.0		65.9		197.6		57.7		173.0	
Fert. Dose (F)		4.4		12.2		3.4		9.4		3.8		10.5	
Int. SX F		10.76		29.82		8.30		23.0		9.26		25.66	

Table 2: Total number of pods plant⁻¹, 100 dry pod weight plant⁻¹ and 100 kernel weight of groundnut as influenced by different treatments (pooled data)

Treatments	Total number of pods plant ⁻¹	100 Dry pod weight (g)	100 Kernel weight
Variety (V)			
V1: RTNG-29	13.42	126.35	53.22
V2: Konkan Gaurav	12.80	126.69	50.11
SEm	0.43	0.51	0.61
CD at 5%	NS	NS	2.39
Spacing (S)			
S1: 30 X 10 cm	12.46	125.75	50.58
S2: 30 X 15 cm	12.86	126.08	52.41

S3: 45 X 10 cm	14.01	127.72	52.01
SEm	0.27	0.71	0.53
CD at 5%	NS	NS	NS
Fertilizer doses (F)			
F ₀ : Control	12.80	125.06	51.71
F ₁ : 25:50:00 kg NPK ha ⁻¹	13.72	126.39	51.56
F ₂ : 30:70:00 kg NPK ha ⁻¹	12.81	128.11	51.73
SEm	0.02	0.02	0.45
CD at 5%	NS	0.06	NS
Interactions			
V x S	NS	NS	NS
V X F	NS	NS	NS
S x F	NS	NS	NS
V x S x F	NS	NS	NS
CV (A)	24.10	2.93	9
CV (B)	12.49	3.36	6
CV (C)	0.73	0.11	3.3

Table 3: Economics of the groundnut as influenced by different treatments (pooled data)

Treatments	Cost of cultivation (Rs ha ⁻¹)	Gross returns (Rs ha ⁻¹)	Net returns (Rs ha ⁻¹)	B:C ratio
Variety (V)				
V1: RTNG-29	75053.98	158769	83714.72	2.10
V2: Konkan Gaurav	69319.14	123439	54119.90	1.76
SEm	-	-	-	-
CD at 5%	-	-	-	-
Spacing (S)				
S1: 30 X 10 cm	80096.15	168432	88335.52	2.08
S2: 30 X 15 cm	68588.41	130044	61455.28	1.88
S3: 45 X 10 cm	67875.12	124836	56961.14	1.83
SEm	-	-	-	-
CD at 5%	-	-	-	-
Fertilizer doses (F)				
F ₀ : Control	70004.03	118983	48978.54	1.69
F ₁ : 25:50:00 kg NPK ha ⁻¹	69191.99	145753	76561.41	2.08
F ₂ : 30:70:00 kg NPK ha ⁻¹	77363.65	158576	81211.99	2.02
SEm	-	-	-	-
CD at 5%	-	-	-	-

Conclusion

Under South Konkan Coastal condition, promising groundnut cultivar, RTNG-29 (*Konkan Bhuratna*) sown with 30X10 cm plant spacing (plant population of 3,33,333 plants ha⁻¹) and fertilized with 30:70:00 NPK kg ha⁻¹ recorded 19.32 % increased pod yield over groundnut cultivar, Konkan Gaurav grown with same plant spacing and fertilizer dose. But in terms of economics groundnut cultivar, RTNG-29 (*Konkan Bhuratna*) sown with 30 X 10 cm plant spacing and fertilized with 25:50:00 NPK kg ha⁻¹ gives more benefit to cost ratio 2.08 with net returns of Rs 76561 ha⁻¹) as that of groundnut cultivar, RTNG-29 (*Konkan Bhuratna*) sown with 30X10 cm plant spacing and fertilized with 30:70:00 NPK kg ha⁻¹ (net returns Rs 71880 ha⁻¹ and B:C ratio 2.02).

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