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EFFECT OF SOWING DATES AND ESTABLISHMENT METHODS ON QUALITY PARAMETER, UPTAKE OF NPK AND ECONOMICS OF GROUNDNUT (*Arachis Hypogaea* L.) UNDER *KONKAN* REGION OF MAHARASHTRA

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Abstract: *The present investigation entitled "Effect of sowing dates and establishment methods on quality parameter, uptake of NPK and economics of groundnut (Arachis hypogaea L.) underkonkan region of Maharashtra" was conducted at Agronomy Farm, Department of Agronomy, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.) during kharif season of 2015. The results revealed that, the gross return (Rs. 209162 ha^{-1}), net return (Rs. 69446 ha^{-1}) and B: C ratio (1.50) was appreciably higher in 23rd MW as compared to the other sowing dates. However, broad bed furrow method of sowing obtained highest gross returns (Rs. 206615 ha^{-1}), net profit (Rs. 68790 ha^{-1}), and B: C ratio (1.50) as compared to flat bed method of sowing. The highest total nitrogen uptake (142.67 kg ha^{-1}, total phosphorus uptake (11.45 kg ha^{-1}) and total potassium uptake (67.82 kg ha^{-1}) recordedunder 23rd MW. Total nitrogen, total phosphorusand total potassium uptakewas significantly higher in crop sown by broad bed furrow than flat bed.*

Key words: *Sowing dates, Plant sapcing, Groundnut.*

Introduction

The groundnut is a valuable food and oilseed crop. It is commonly called as the king of vegetable oilseeds crops or poor man's nut. The groundnut (also called pea nut, earth nut, monkey nut, goober nut, manila nut, pinder and panda nut) is a native of South American leguminous oil seed (Hammons 1982).

The groundnut is slow growing annual plant with central upright stem. The plant grows 30 to 60 cm high and produced angular hairy stem with spreading and erect branches. The spreading varieties have pods scattered along their prostrate branches from base of plant of the erect or bunchy type. It has relatively deep tap root with well-developed lateral root system. The flowers are borne at the axils of the leaves, after fertilization of flowers formation of pegs takes place and then pegs are penetrated below the ground. Groundnut is a rich source of oil, which supplies about 500 calories per 100 g which is higher than all vegetable proteins. Groundnut is also a rich source of minerals and vitamins like vitamin-B, vitamin-E (tocopherol) *etc.* Groundnut plays an important role in the rural economy of India, which constitute the important component of Indian diet. Kernel contains 48 to 50 per cent of edible oil, 25 per cent protein and 20 per cent of the carbohydrates (Weiss, 1983).

The major groundnut growing states of India are Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra. In India, during the year 2010-11 the area under this crop was 6.10 million ha with its annual production of 7.53 million tonnes and productivity of 1234 kg per ha(Anonymous, 2011a). However, in Maharashtra area under groundnut was 2.58 lakh ha in *kharif* season (2010) and production was 3.47 lakh tonnes with an average productivity of 1344 kg per ha, while in summer season (2010-11) area was 0.82 lakh ha and production was 1.2 lakh tonnes with an average productivity of 1463 kg per ha. (Anonymous, 2011b).

Groundnut crop can be grown under wide range of climatic condition but it is grows best in temperature range between 22 ^{0}C and 37 ^{0}C. The

productivity of groundnut in Maharashtra state is much below the productivity in the other states. This due to non-availability of good quality seed of improved varieties, improper sowing time and establishment methods, non-availability of timely and adequate irrigation during the crop growth period, improper nutrition and pest management. Out of several factors responsible for its low productivity, proper date of sowing under high rainfall condition is considered as major constraint. In dry land agriculture, farmers have limited choice for sowing time, but in irrigated situation sowing time is one of the most important non-monetary inputs affecting yield of crops (Sardana and Kandhol, 2007). Growth and yield of a crop depends on a number of factors; however, climate plays the most important role. Among the climatic parameters role of solar radiation, temperature, humidity and rainfall is very crucial. The oilseed crop, particularly groundnut is a very sensitive to climatic parameters such as radiation and temperature.

For obtaining better growth and yield of groundnut crop proper sowing time and method of sowing with better variety are important. Groundnut is popular among the farmers because it provides greater and assured returns compare to most of competing crops.

Material and Method

The trial was laid out in a strip plot design with four replications. The treatments included four different sowing dates *i.e.* 23rd MW (S_1), 25th MW (S_2), 27th MW (S_3) and 29th MW (S_4) in vertical strips. Horizontal strips consisted two establishment methods *i.e.* flatbed (M_1) and broad bed furrow (M_2).

The gross plot size was 4.00 m x 3.00 m and net plot size was 3.40 m x 2.70 m, respectively. The soil of the experimental plot was sandy clay loam in texture, slightly acidic in pH and medium in organic carbon content. It was low in available nitrogen, medium in available phosphorus and potassium. The sowing was done in the experimental plot in four sowing dates i.e. metrological weeks 23rd, 25th, 27th and 29th MW by two establishment methods (flat bed and broad bed furrow) at a distance 30 cm X 15 cm. The other recommended package of practices was followed time to time and periodical growth observations were recorded.

Results and discussion

Data on the quality aspect of groundnut presented in Table 1 showed that the improvement in oil content and oil yield was evident due to sowing from 23rd MW and 25th MW. After that conspicuous reduction in oil content was noticed. The lowest oil content as well as oil yield was recorded due to sowing in 29th MW. Marked increase in oil yield (8.22 q ha^{-1}) was evident by sowing groundnut in 23rd MW over later sowing. The protein content decreased as sowing was delayed. Highest values of protein content (28.91) was obtained by sowing groundnut in 23rd MW as compared to delayed sowing in 25th MW, 27th MW and 29th MW. These observations suggest that, the oil and protein synthesis are favoured due to early sowing environment in addition to growth and yield. Eventually, oil yield and protein content were also raised further in early sown crop. The result brought out clearly that, the overall quality and quantity of groundnut crop is weather dependent and hence due attention needs to be paid for timely sowing of the crop as it is important oil seed crop. These results conform to the findings reported by Gupta *et al.* (1983), Sardana and Kondhola (2007, Bala *et al.* (2011), Prathima*et al.* (2012) and Meena *et al.* (2014).In case of quality study indicated that the oil and protein content were significantly influenced due to different methods of sowing. Sowing by broad bed furrow produced more protein and oil content in groundnut over flat bed method of sowing. These results collaborated with findings reported by Patra*et al.* (1996). The results, thus suggested that yield maximization and quality improvement in groundnut is possible by broad bed furrow rather than the conventional way of planting on flat beds.

The significantly highest total nitrogen uptake (142.67 kg ha^{-1}) was recorded when crop sown in 23rd MW followed by 25th MW, 27th MW and 29th MW. The groundnut crop sown in 29th MW recorded significantly lowest total nitrogen uptake

(102.00 kg ha^{-1}) however, total nitrogen uptake was significantly higher when crop sown on broad bed furrow method than flat bed method.These results conform to the finding reported by Prathima*et al.* (2012) and Meena *et al.* (2014). The groundnut crop sown in 23rd MW recorded highest total phosphorus uptake(11.45 kg ha^{-1}) and which was significantly superior over rest of the sowing dates followed by 27th MW and 29th MW. The crop sown in 29th MW (7.52 kg ha^{-1}) recorded lowest total phosphorus uptake. Total phosphorus uptakewas significantly higher in sowing by broad bed furrow than the flat bed.These results conform to the finding reported by Goracha (1979), Ahmad *et al.* (2007), Prathima*et al.* (2012) and Meena *et al.* (2014). The highest total potassium uptake (67.82 kg ha^{-1}) was recorded when the crops sown in 23rd MW and which was significantly superior over all other sowing dates. The crop sown in 29thMW recorded lowest total potassium (52.64 kg ha^{-1}). Data revealed that, the total potassium uptakewas significantly higher in crop sown by broad bed furrow than flat bed.These results are in agreement with the Patra*et al.* (1996), Baskaran*et al.* (2003), Chandrika*et al.* (2008) and Prathima*et al.* (2012).

The groundnut crop sown in 23rd MW recorded significantly higher dry pods yield (24.89 q ha^{-1}) over rest of the sowing dates. The dry pods yield reduction with each delay in sowing of groundnut after 23rd MW was graded and significant and the broad bed furrow method of sowing recorded significantly the highest dry pod yield as compared to flat bed. These results conform to the finding reported by Goracha (1979), Ahmad *et al.* (2007), Prathima*et al.* (2012), Meena *et al.* (2014) and Ahmad *et al.* (2007).As regards economics, the data presented in Table 2 indicated that gross return (*Rs.*209162 ha^{-1}), net return (*Rs.* 69446 ha^{-1}) and B: C ratio (1.50) was appreciably higher due to sowing in 23rd MW as compared to the other sowing dates. This was due to higher yield of early sown crop than the delayed sowing. Thus the economic stability of the crop can be ensured by sowing it early in the season. These results are in line with those reported by Goracha (1979), Kumar *et al.* (2003) and Meena *et al.* (2014).Regarding economics, data presented in Table 2showed that the gross returns (*Rs.* 206615 ha^{-1}), net profit (*Rs.* 68790 ha^{-1}), and B: C ratio (1.50) markedly improved due to broad bed furrow method of sowing as compared to flat bed method of sowing could be supported by findings obtained by Bheemappa*et al.* (1994).

Conclusion

On the basis of results obtained during study, it can be concluded that for obtaining higher gross return (*Rs.* 209162 ha^{-1}), net return (*Rs.* 69446 ha^{-1}) and B: C ratio (1.50) was appreciably higher in 23rd MW. However, broad bed furrow method of sowing obtained highest gross returns (*Rs.* 206615 ha^{-1}), net profit (*Rs.* 68790 ha^{-1}), and B: C ratio (1.50). The highest total nitrogen uptake (142.67 kg ha^{-1},total phosphorus uptake(11.45 kg ha^{-1}) and total potassium uptake (67.82 kg ha^{-1}) recordedunder 23rd MW and total nitrogen, total phosphorusand total potassium uptakewas significantly higher in crop sown by broad bed furrowlateritic soils of *Konkan* region.

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Weiss, (1983). Kernel contains percentage of edible oil, protein and carbohydrates.

Table 1: Effect of sowing dates and establishment methods on quality parameter and uptake of NPK of groundnut

Treatment	Oil content (%)	Oil yield (q ha-1)	Protein content (%)	N uptake (kg ha-1)			P uptake (kg ha-1)			K uptake (kg ha-1)			Dry pod yield (q ha-1)
				Kernel	Haulm	Total	Kernel	Haulm	Total	Kernel	Haulm	Total	
Sowing dates (Vertical strip)													
S1 – 23rd MW	47.48	8.22	28.91	79.82	62.86	142.67	5.67	5.78	11.45	33.45	34.18	68.82	24.8
S2 – 25th MW	46.58	7.15	27.99	68.32	57.96	126.28	4.89	5.10	9.99	29.39	31.91	61.30	22.5
S3 – 27th MW	45.47	6.45	27.32	61.77	51.92	113.69	4.37	4.08	8.45	26.97	28.68	55.65	21.4
S4 – 29th MW	44.97	5.99	25.91	52.82	49.18	102.00	4.08	3.44	7.52	24.99	27.65	52.64	20.4
S.E. (m) ±	0.46	0.21	0.51	0.59	1.03	3.33	0.36	0.29	0.45	0.85	0.45	1.00	0.55
C.D. at 5%	0.58	0.67	1.63	1.88	3.28	10.64	1.14	0.93	1.43	2.72	1.44	3.18	1.76
Methods of sowing (Horizontal strip)													
M1 – Flat bed	44.36	5.84	27.44	57.61	49.87	107.47	3.99	3.62	7.61	24.78	28.10	52.88	20.0
M2 – BBF	47.89	8.07	27.63	73.76	61.10	134.85	5.51	5.58	11.09	32.62	33.21	65.83	24.6
S.E. (m) ±	0.18	0.06	0.27	0.54	0.44	0.36	0.05	0.19	0.17	0.19	0.34	0.42	0.17
C.D. at 5%	0.58	0.19	N.S.	1.74	1.40	1.15	0.15	0.60	0.54	0.61	1.08	1.35	0.55
Interaction effect													
S.E. (m) ±	0.59	0.26	0.58	1.64	1.18	1.84	0.24	0.31	0.34	0.78	0.70	1.20	0.70
C.D. at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
General mean	46.13	6.95	27.53	65.68	55.48	121.16	4.75	4.60	9.35	28.70	30.65	59.35	22.3

Table 2: Total cost, gross return, net inco me and B: C ratio of groundnut as influenced by different treatments

Treatment	Gross return (*Rs.* ha-)	Cost of cultivation (*Rs.* ha-1)	Net return (*Rs.* ha-1)	B : C ratio
Sowing dates (Vertical strip)				
S1 – 23rd MW	209162.50	139716.48	69446.02	1.50
S2 – 25th MW	189460.63	136432.84	53026.54	1.39
S3 – 27th MW	179838.19	134838.93	45008.26	1.33
S4 – 29th MW	172068.75	133534.19	38534.56	1.29
S.E. (m) ±				
M1 – Flat bed	168649.38	134432.20	34217.18	1.25
M2 – BBF	206615.16	137824.02	68790.51	1.50