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Standardization of Potash Levels and Apportioning Time in Summer Groundnut under Drip Irrigation

P.H. Deshmukh*, D.P. Pacharne and N.K. Bhute
AICRP on Groundnut, Cotton Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri-413722 (M.S.) India
**Corresponding Author Email : phd17166@gmail.com*

Abstract

A field experiment was carried out during 2015-16 and 2017-18 at AICRP on Groundnut, MPKV, Rahuri (M.S.) on sandy clay loam soil, to evaluate the Standardization of potash levels and apportioning time in *Summer* groundnut under drip irrigation. The treatment consist of three potash levels *viz.,* K_1: 10 kg K_2O per ha ,K_2: 20 kg K_2O per ha, K_3: 30 kg K_2O per ha with four apportioning time *viz.,* T_1: Fertigation of potash uniformly in equal splits at weekly interval upto 30 DAS (3 Splits),T_2: Fertigation of potash uniformly in equal splits at weekly interval upto 45 DAS (6 Splits),T_3: Fertigation of potash uniformly in equal splits at weekly interval upto 60 DAS (8 Splits),T_4: Fertigation of potash uniformly in equal splits at weekly interval upto 75 DAS (10 Splits) under Drip irrigation systems. The experiment was laid out in a split plot design with three replications. The application of 30 kg K_2O per ha to summer groundnut crop recorded higher growth and yield attributes and its beneficial effect to increase the dry pod yield (4158 kg/ha) and gross monetary returns (Rs. 145265/ ha), net monetary returns (Rs. 75420/ ha) and B:C ratio (1.98) than as compared to rest of all treatments. The apportioning of fertigation of potash in equal splits at weekly interval upto 75 DAS (10 Splits) recorded highest dry pod yield (3988 kg/ha) and economic indices like gross monetary returns (Rs. 140123/ ha), net monetary returns (Rs. 68941/ ha) and B:C ratio (1.94) than rest of all treatments but it was at par with fertigation of potash uniformly in equal splits at weekly interval upto 60 DAS (8 Splits). The application of 30 kg K_2O per ha with apportioning of potash fertigation uniformly in equal splits at weekly interval upto 75 DAS (10 Splits) under drip irrigation is beneficial for higher growth, yield and economics of summer groundnut (*Arachis hypoaea* L.).

Key words : *Fertigation, potash levels, apportioning time, yield of dry pod and haulm.*

Introduction

Groundnut (*Arachis hypogaea* L.), is king of oilseeds belongs to the family Leguminoceae and is commonly called as poor man's almond. It is the world's fourth most important source of edible oil and third most important source of vegetable protein. It has a distinct position among the oilseeds as it can be consumed and utilized in diverse ways. It is a rich source of edible oil (44-55%), high quality protein (22-36%) and carbohydrates (6-24%) and hence, it is valued both for edible oil and confectionery purposes. Nutritionally and commonly it is very important source of oil and agriculturally it improves fertility status of soil by fixing the free atmospheric nitrogen (200 kg ha^{-1}) symbiotically with free *Rhizobium* bacteria, thereby reduces the fertilizer requirement of succeeding crops. Groundnut kernels are consumed as raw, boiled, roasted or fried products and also used in a variety of culinary preparations like peanut candies, butter, peanut milk and chocolates (1).

Major groundnut producing countries of the world are India, China, USA, Sengal, Brazil, and West Africa. Groundnut occupies an area of 24.7 million hectares in the world with a total production of 33 million tonnes. India occupies the first place in acreage but stands second in production (18.42%) after China (41.5%). The area under groundnut in India was estimated to be 4886.3 thousand hectares with a production of 57.79 lakh tonnes in 2012-2013. Gujarat accounts for 36 per cent of the total production of groundnut and it is the largest producer in India followed by Tamil Nadu (20.78%), Andhra Pradesh (15.23%), Rajasthan (8.23%), Maharashtra (8.23%) and Karnataka (7.82%) (2). Groundnut is a legume crop having maximum nitrogen reductase activity and which are beneficial to absorb elemental nitrogen and stored into root nodules (3). Increasing levels of phosphorus enhanced the growth parameters, yield attributes and yield (4). In summer groundnut frequent water is more beneficial and potash given along with ferigation schedule is urgent need to increase the yield of summer groundut and also benfecial to saving of fertilizer to increase fertilizer use efficiency (5). For this purpose research is essential for knowing the optimum use of potash levels with uniformly in equal splits in fertigation of potash to summer groundnut. Keeping these points in view, the present investigation was undertaken to study the performance of potash levels and apportioning time in *Summer* groundnut under drip irrigation.

Materials and Methods

A field experiment was carried out during 2015-16 and

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Table-1 : Growth and yield attributes of summer groundnut as influenced by different treatments.

Treatment	Growth and Yield attributes				
	Plant height (cm)	No. of. branches/ Plant	Dry matter/ plant (gm)	No. of pods/ Plant	Oil content (%)
Main Plot : Potash levels					
K_1 : 10 kg K_2O per ha	20.50	11.18	18.02	19.72	44.53
K_2 : 20 kg K_2O per ha	20.92	11.53	19.02	23.63	45.37
K_3 : 30 kg K_2O per ha	24.25	11.43	23.63	26.35	46.78
S.Em±	0.36	0.20	0.53	0.50	0.11
C.D. (P=0.05)	1.42	NS	2.08	1.98	0.45
Sub Plot : Apportioning time					
T_1 : Fertigation of potash uniformly in equal splits at weekly interval upto 30 DAS (3 Splits)	21.62	11.16	18.69	23.56	45.46
T_2 : Fertigation of potash uniformly in equal splits at weekly interval upto 45 DAS (6 Splits)	21.20	11.11	19.18	24.11	45.42
T_3 : Fertigation of potash uniformly in equal splits at weekly interval upto 60 DAS (8 Splits)	21.53	11.56	22.49	23.02	45.63
T_4 : Fertigation of potash uniformly in equal splits at weekly interval upto 75 DAS (10 Splits)	23.20	11.71	20.59	22.24	45.73
S.Em±	0.56	0.17	0.39	0.57	0.47
C.D. (P=0.05)	NS	NS	1.171	NS	NS
Interaction					
S.Em±	0.97	0.30	0.68	0.98	0.82
C.D. (P=0.05)	NS	NS	2.03	2.93	2.43

2017-18 at AICRP on Groundnut MPKV, Rahuri (M.S.) on sandy clay loam soil with low in available nitrogen (172.11 kg ha^{-1}), medium in available phosphorus (18.02 kg ha^{-1}) and high in available potassium (427.0 kg ha^{-1}) and moderate in Fe (6.89 µg g^{-1} soil), Mn (9.51 µg g^{-1}soil), Zn (0.62 µg g^{-1} soil) and Cu (3.41 µg g^{-1} soil). The soil was moderately alkaline in reaction (pH 8.2). The electrical conductivity, organic carbon and $CaCO_3$ were 0.29 dSm^{-1}, 0.54 and 4.50 %, respectively. The treatment consist of three potash levels *viz.,* K_1: 10 kg K_2O per ha ,K_2: 20 kg K_2O per ha, K_3: 30 kg K_2O per ha with four apportioning time *viz.,* T_1: Fertigation of potash uniformly in equal splits at weekly interval upto 30 DAS (3 Splits), T_2: Fertigation of potash uniformly in equal splits at weekly interval upto 45 DAS (6 Splits),T_3: Fertigation of potash uniformly in equal splits at weekly interval upto 60 DAS (8 Splits),T_4: Fertigation of potash uniformly in equal splits at weekly interval upto 75 DAS (10 Splits) under Drip irrigation systems. The experiment was laid out in a Split plot design with three replications. The variety of groundnut sown to Phule Unnati (RHRG-683). As regards,for data collection on growth and yield attributing characters of five plants were selected at randomly from each plot. The harvested crop is sundried as per treatment wise, threshed and yield of seeds were obtained from net plot and converted it into q/ha. While calculating gross return from prevalent market price for sale of groundnut pod was taken as Rs.40.0/kg. Net returns was calculated by deducting cost of cultivation from gross income and benefit/cost ratio was calculated by dividing total cost of cultivation (₹/ha) to gross returns (₹/ha).

Results and Discussion

Effect of potash levels on growth, yield and economics of groundnut : The data presented in Table-1 and 2 revealed that the application of different potash levels significantly affected the growth, yield attributes and yield of summer groundnut. The application of 30 kg K_2O per ha to groundnut crop produced significantly higher growth and yield attributes *viz.,* plant height (24.25 cm), dry matter per plant (23.63 gm), number of pods (26.35) and oil content (46.78 %). The higher growth and yield attributes were beneficial to increase the dry pod yield (4158 kg/ha) and haulm yield (7048 kg/ ha) than as compared to rest of all treatments. The application of 30 kg K_2O per ha to groundnut crop recorded maximum gross monetary returns (Rs. 145265/ ha), net monetary returns (Rs. 75420/ ha) and B:C ratio (1.98) than rest of all potash levels. Similar results registered by (6,7,8).

Effect of apportioning time on growth, yield and economics of groundnut : The apportioning time of different potash levels differed significantly on summer groundnut crop in Table-1 and 2. The were significantly affected due to apportioning time. The fertigation of potash uniformly in equal splits at weekly interval upto 75 DAS (10 Splits) recorded higher growth and yield attributes *viz,* plant height (23.20 cm), dry matter per plant (20.59 gm), number of pods (22.24) and oil content (45.73%). The higher growth characters and yield attributes resulted in increased the highest dry pod yield

Table-2 : Yield and economics of groundnut as influenced by different treatments.

Treatment	Yield of groundnut		Economics		
	Dry pod (q/ha)	Dry Haulm (q/ha)	Gross Monetary Returns (Rs/ ha)	Net Monetary Returns (Rs/ ha)	B : C Ratio
A. Main plot : Potash levels					
K_1 : 10 kg K_2O / ha	3248	4687	116120	45112	1.60
K_2 : 20 kg K_2O / ha	3647	5845	128456	57654	1.80
K_3 : 30 kg K_2O / ha	4158	7048	145265	75420	1.98
S.Em±	90	78	3348	3348	0.04
C.D. (P=0.05)	278	289	11861	11001	0.15
B. Sub Plot : Apportioning time					
T_1 : Fertigation of potash uniformly in equal splits at weekly interval upto 30 DAS (3 Splits)	3345	5345	117852	47350	1.60
T_2 : Fertigation of potash uniformly in equal splits at weekly interval upto 45 DAS (6 Splits)	3457	5760	123451	54650	1.70
T_3 : Fertigation of potash uniformly in equal splits at weekly interval upto 60 DAS (8 Splits)	3945	5891	140240	68451	1.88
T_4 : Fertigation of potash uniformly in equal splits at weekly interval upto 75 DAS (10 Splits)	3988	6025	140123	68941	1.94
S.Em±	97	140	3342	3345	0.5
C.D (P=0.05)	290	425	10132	10120	0.14
C. Interaction effect					
S.Em±	160	240	5845	5861	0.08
C.D. (P=0.05)	NS	NS	NS	NS	NS

(3988 kg/ ha) and dry haulm yield (6025 kg/ ha) as compared to all fertigation treatments. The apportioning of fertigation of potash in equal splits at weekly interval upto 75 DAS (10 Splits) recorded maximum gross monetary returns (Rs. 140123/ ha), net monetary returns (Rs. 68941/ ha) and B:C ratio (1.94) than rest of all treatments but it was at par with fertigation of potash uniformly in equal splits at weekly interval upto 60 DAS (8 Splits). These results are in conformity with the results obtained by (5).

Interaction effect : Interaction effect between potash levels and apportioning time were found to be significant, where the combination of application of 30 kg K_2O per ha with fertigation of potash uniformly in equal splits at weekly interval upto 60 DAS (8 Splits) produced significantly higher dry pod yield (4158 kg/ha) than rest of all treatment combinations.

On the basis of three years experiment, it could be concluded that the application of 30 kg K_2O per ha with apportioning of potash fertigation uniformly in equal splits at weekly interval upto 75 DAS (10 Splits) under drip irrigation is beneficial for higher growth, yield and economics of summer groundnut (*Arachis hypogaea* L.).

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