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Performance of Groundnut in Saline Water under Drip Irrigation System

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ABSTRACT

A field experiment was conducted during *rabi* season of 2015-16 at Saline Water Scheme, Agricultural College Farm, Bapatla on sandy loam soil to evaluate the performance of groundnut varieties with saline water given through dripirrigation system. The experiment was laid out in split plot design with three replications. The three groundnut varieties namely, Anantha, Kadiri 6 and Kadiri 7 were allotted to main plots and five salinity levels of irrigation water such as Best Available Water (BAW) having EC (0.6dS m^{-1}), 2, 4, 6 and 8 dS m^{-1} were considered for sub plots. The result revealed that maximum pod yield of 2052 kg ha^{-1} was recorded with BAW (EC 0.6 dS m^{-1}) among the different levels of saline water given through drip irrigation. Among the three groundnut varieties, Kadiri 6 produced the highest pod yield of 1776 kg ha^{-1} followed by Kadiri 7 (1696 kg ha^{-1}). Increased salinity levels increased yield reduction recording 5.9,11.4,28.5 and 44.2% yield reduction in the treatments irrigated with salinity levels of 2, 4,6 and 8 dS m^{-1},respectively as compared to yield obtained by irrigation with BAW of 0.6 dS m^{-1}.

Keywords: *Salinity levels, Groundnut crop*, *Drip irrigation and Yield reduction.*.

Water is needed to ensure food security, industrial production and conserve the biodiversity of the ecosystem. Due to burgeoning population and increasing high standard of living, demand of water in domestic as well as industrial sectors is increasing at a much faster rate. Thus all eyes are on the agricultural sector to release a part of the fresh water for other sectors. Thus use of saline water and the water that have been used once and have not lost their potential for use in agriculture need to be exploited for crop production (Gupta and Gupta, 2003). But, utilization of saline water for irrigation is associated with salt accumulation in the soil, which has negative impact on plant growth through three major components *viz*., osmotic, nutritious and toxic stress.

Groundnut (*Arachis hypogaea* L.) is an important crop grown in an area of about 26 m ha around the world (FAO, 2013) under different agro-climatic conditions for its nutritious and oil rich kernel. However, in India, groundnut is one of the major oilseeds crop with its largest area in the world, but the area and production of this crop is fluctuating between 6.0 – 8.5 m ha and 6.0 – 9.5 million tones, respectively, mainly due to climatic variations and biotic and abiotic stresses. Soil salinity, spread in about 4.0 m ha area (Chhabra and Kamra, 2010) in the major groundnut growing states of India.Soil Salinity is one of the most important abiotic factors affecting the groundnut productivity.Peanut is grown under both rain fed and irrigated conditions and more than half of the production area is under rainfed (Woli*et al.,* 2013). In recent years, due to drought its yield has declined, hence, drip irrigation which delivers water through the use of pressurized pipes that run close to the plants and that can be placed on the soil surface or below ground. This method is highly efficient because only the immediate root zone of each plant is wetted and helps to achieve yield gains of up to 100% and water savings of up to 40-80%, hence the present investigation was taken up.

MATERIAL AND METHODS

A field experiment was conducted at Saline Water Scheme, Agricultural College Farm , Bapatla during 2015-16. The experiment was conducted in split plot design with three replications in permanently fixed layout with three varieties in main plots *viz*., Anantha, Kadiri 6 and Kadiri 7 and four salinity levels of 2, 4, 6 and 8 dS m^{-1} water with one control *i.e* BAW (0.6 dS m^{-1}). The experimental soil was sandy loam having a pH of 7.03 and EC 0.4 dS m^{-1}, low in available nitrogen (75kg N ha^{-1}) medium in phosphorous (27 kg P_2O_5 ha^{-1}) and high in potassium (320 kg K_2O ha^{-1}). Nitrogen, phosphorus and potassium were applied through urea, single super phosphate and murate of potash, respectively. All other agronomic practices were followed as per recommendation. The data were collected by selecting five plants randomly in each plot and the data were subjected for stastical analysis.

Table 1. Plant height (cm) in groundnut crop as influenced by saline water through drip irrigation system

Varieties	Salinity levels (dS m^{-1})					
	BAW(0.6)	EC-2	EC-4	EC-6	EC-8	Mean
Anantha	42.3	43.1	40.3	32.9	34.8	38.7
Kadiri6	44.7	43.3	41.7	40	32.1	40.4
Kadiri7	42.5	39	37.5	37.3	33.07	37.9
Mean	43.2	41.8	39.8	36.7	33.1	
	SEm±	CD (0.05)	CV (%)			
Varieties	2	NS	14.4			
Salinity levels	1.5	4.8	8.1			
Interactions:						
V at same S	3.2	NS				
S at same or different V level	4.5	NS				

Table 2. Pod yield of groundnut crop as influenced by saline water through drip irrigation system

Varieties	Salinity levels (dS m^{-1})					
	BAW(0.6)	EC-2	EC-4	EC-6	EC-8	Mean
Anantha	1967	1900	1800	1367	850	1577
Kadiri6	2200	2033	1817	1567	1263	1776
Kadiri7	1990	1860	1840	1470	1320	1696
Mean	2052	1931	1819	1468	1144	
	SEm+	CD (0.05)	CV (%)			
Varieties	130	NS	13			
Salinity levels	65	211	6			
Interactions:						
V at same S	224	654				
S at same or different V level	103	284				

Table 3. Haulm yield (kg ha^{-1}) of groundnut crop as influenced by saline water through drip irrigation system

Varieties	Salinity levels (dS m^{-1})					
	BAW(0.6)	EC-2	EC-4	EC-6	EC-8	Mean
Anantha	2467	2400	2300	1867	1350	2077
Kadiri6	2733	2533	2317	2067	1763	2283
Kadiri7	2490	2360	2340	1970	1820	2196
Mean	2563	2431	2319	1968	1644	
	SEm+	CD (0.05)	CV (%)			
Varieties	134	813	13			
Salinity levels	66	216	6			
Interactions:						
V at same S	231	675				
S at same or different V level	104	289				

RESULTS AND DISCUSSION

Plant height (cm)

Saline irrigation negatively affected plant growth and the growth parameters decreased with increased levels of salinity. Plant height was significantly affected by salinity levels in all groundnut varieties. The highest plant height of 43.2 cm was recorded at a salinity level of 0.6 dS m^{-1} (BAW), which was significantly superior to the 6 and 8 dS m^{-1} whereas, the lowest plant height of 33.3 cm was observed at the maximum salinity level of 8 dS m^{-1}. The varieties did not differ much with regard to plant height. Kadiri 6 recorded the slightly higher plant height (40.4 cm) as compared to Anantha and Kadiri 7. Low plant height was observed due to reduced photosynthesis, which in turn limited the supply of carbohydrate needed for growth (Alam *et al*, 2004). There is no significant interaction affect among salinity levels and groundnut varieties.

Pod yield (kg ha^{-1})

Salinity, which causes reductions in yield, is one of the important abiotic constraints in groundnut production. Consequently there is differential reduction in growth and yield when grown in salt affected soils.The data pertaining to pod yield was found to be significantly influenced by salinity levels, groundnut varieties and also by their interaction. The result revealed that maximum pod yield of 2052 kg ha^{-1} was recorded with BAW treatment. The lowest pod yield of 1144 kg ha^{-1} was observed at the highest salinity level of 8 dS m^{-1}.The significant and gradual reduction in grain yield with progressive increase in soil salinity could be mainly due to the cumulative effect of yield attributing characters.

Among the three groundnut varieties, Kadiri 6 produced significantly the highest pod yield of 1776 kg ha^{-1}as compared to the varieties whereas, the lowest pod yield (1577 kg ha^{-1}) was recorded by Anantha variety. The significant interaction affect was observed between salinity levels and varieties. The highest pod yield (2200 kg ha^{-1}) of groundnut was recorded by the treatment combination of kadiri 6 with BAW (0.6 dS m^{-1}) and the lowest pod (850 kg ha^{-1}) yield was recorded with anantha variety at 8 dS m^{-1} salinity level. This is because salinity inhibits plant growth by exerting low water potentials, ion toxicity and ion imbalance. Similarly soil salinity showed negative affect on yield in *Brassica napus* (Zadeh and Naeini, 2007).Under highest salinity level of 6.0 dS m^{-1} a marked decrease was observed in seedling emergence, plant height, root length and pod yield of groundnut crop (Meena*et al.*, 2017)

Haulm yield (kg ha^{-1})

The data pertaining to haulm yield was found to be significantly influenced by salinity levels, groundnut varieties and also their interaction. The results revealed that maximum haulm yield of 2563 kg ha^{-1} was recorded with BAW treatment whereas the lowest pod yield of 1644 kg ha^{-1} was observed at the highest salinity level of 8 dS m^{-1}. Salinity decreased 24% haulm yield in groundnut crop (Meena *et al*., 2016). Among the three groundnut varieties, Kadiri 6 produced significantly the highest haulm yield of 2283 kg ha^{-1}as compared to the rest of the varieties and the lowest pod yield (2077 kg ha^{-1}) was recorded by Anantha variety.

The significant interaction affect was observed between salinity levels and varieties. The highest haulm yield (2733 kg ha^{-1}) of groundnut was recorded with the treatment combination of Kadiri 6 with at BAW (0.6 dS m^{-1}) and the lowest haulm yield (1350 kg ha^{-1})was recorded with Anantha variety at 8 dS m^{-1}.

CONCLUSION

The present studys clearly indicated that the highest pod yield was recorded in Kadiri 6 (1776 kg ha^{-1}) as compared to other varieties. Among the salinity levels the highest pod yield (2052 kg ha^{-1}) was recorded with BAW and it was significantly superior to 6 EC and 8 EC irrigation waters and it was on par with 2 and 4 EC salinity level. It was concluded that irrigation with saline water up to 4EC was found to be better when compared to 6 and 8 EC irrigation water through drip system for growing groundnut crop.

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