Andhra Pradesh J Agril. Sci : 5(4): 229-236, 2019

ROLE OF SILICON AND SALICYLIC ACID IN GROWTH AND YIELD OF GROUNDNUT UNDER MOISTURE STRESS CONDITIONS

M.S. MIKHINA*, P. SANDHYA RANI, P. LATHA AND V. CHANDRIKA

Department of Crop Physiology, S.V. Agricultural College, Tirupati, A.P. 517502

Date of Receipt: 29-06-2019 Date of Acceptance: 14-10-2019

ABSTRACT

A field experiment was carried out during *rabi* 2018-19 at Dry land farm, S.V. Agricultural College, Tirupati to know the "Effect of silicon and salicylic acid on growth and yield of groundnut under moisture stress conditions". The research was designed in strip plot with two varieties (Dharani and Kadiri-6) replicated thrice with a net plot size of 2.5 m × 4.5 m. Treatments comprised of control (irrigated and stress), water spray, Potassium silicate @ 0.4% and 0.2%, Salicylic acid @ 100 PPM, 200 PPM and Potassium Chloride @ 0.2%. A uniform dose of N, P_2O_5 and K_2O @ 20-40-50 ha^{-1} were applied as basal at the time of sowing through urea, single super phosphate and muriate of potash, respectively. Gypsum was applied @ 500 kg ha^{-1} at 35 DAS, while all other agronomic practices were kept constant for all the treatments. The data from the field (yield components) as well as lab analysis was recorded according to the standard procedures. Silicon showed significant effect on growth and yield. Potassium silicate @ 0.4% produced maximum plant height, specific leaf area, relative water content, pod yield and minimum membrane injury.

KEYWORDS: Groundnut, growth, moisture stress, foliar application, yield**.**

INTRODUCTION

Groundnut is called as the 'King' of oilseeds. It is one of the most important food and cash crop of our country. It is also called as 'wonder nut' and 'poor man's cashew nut'. Even though it is a low-priced commodity but highly rich in all the nutrients. It is an important oil and feed legume crop grown in over 100 countries. The oil content of the seed varies from 48 to 50 per cent depending on the varieties and agronomic practices. Food security largely depends on the ability to increase production with decreasing availability of water to grow crops. Water availability is one of the most important restricting factors in crop production in the world.

Yield losses due to drought are highly variable in nature depending on intensity, duration & timing, coupled with other location specific environmental stress factors such as temperature and high irradiance. Silicon (Si) is one of the most prevalent macro elements, and it is classified as beneficial element which performing an essential function in healing plants in response to environmental stresses. The purpose of using Si is to induce resistance to various stresses, pest and pathogens. Scientists demonstrated that different forms of Si preparing the defence responses which are fully deployed at the onset of the stress. Under controlled conditions, Si probably activates the metabolic status of the plant by making it more efficient in responding to exogenous stimuli.

Salicylic acid (SA) is one of the important signalling molecules that cause the reaction of the plant against environmental stresses. Like a non-enzyme antioxidant, salicylic acid plays a crucial role in regulating various physiological processes such as growth, development, ion uptake and photosynthesis. Salicylic acid increases antioxidant enzymes and supports the plant against damage resulted from oxidative reactions.

Foliar application involves the use of fertilizers as a liquid-solution. It results in fast absorption and utilization and has the advantage of quickly correcting deficiencies diagnosed by observation or foliar analysis. Other advantages are requirement of low application rates of fertilizers and uniform distribution of fertilizer. Besides, foliar fertilization can help in mitigating drought stress. The yield loss is higher under terminal moisture stress compared to mid season stress. Groundnut has semi determinate growth habit with high plasticity and capable of recovering from drought stress. However, faster recovery from drought stress and sustaining yield is priority in irrigated cultivation. The present study was designed to investigate the effect of foliar application of different concentrations of silicon and salicylic acid on growth and yield of groundnut under moisture stress

*Corresponding author, E-mail: mikhinams@gmail.com

conditions. The main objective was to evaluate effect of silicon and salicylic acid on crop growth and yield under moisture stress conditions and to assess its efficacy in enhancing drought tolerance under imposed moisture stress conditions.

MATERIAL AND METHODS

Experiment was conducted at Dry land farm, S.V Agricultural College, Tirupati campus of Acharya N.G. Ranga Agricultural University, during *rabi* season, which is geographically situated at 13.5°N latitude and 79.5°E longitude with an altitude of 182.9 m above the mean sea level in the Southern Agro-Climatic Zone of Andhra Pradesh, on sandy loam soil during 2018-19.

Two groundnut varieties, Dharani and Kadiri 6 (K-6) were used in this study. The experimental field was 540 m^2 and the size of the individual plots was 2.5 m × 4.5 m, healthy seeds were treated with mancozeb @ 3 g kg^{-1} to control fungal diseases and sown manually with spacing of 22.5 cm between the rows and 10 cm in between the plant. Before cultivation soil analysis according to standard procedure was performed. A uniform dose of N, P_2O_5 and K_2O @ 20-40-50 per ha were applied as basal at the time of sowing through urea, single super phosphate and muriate of potash, respectively. Treatments included in the experiment were as following, T_1: RDF + Control (Irrigated), T_2: RDF + Control (Stress), T_3: RDF + Foliar application of water, T_4: RDF + Foliar application of Potassium silicate @ 0.2%, T_5: RDF + Foliar application of Potassium silicate @ 0.4%, T_6: RDF + Foliar application of Salicylic acid @ 100 PPM, T_7: RDF + Foliar application of Salicylic acid @ 200 PPM, T_8: RDF + Foliar application of Potassium Chloride @ 0.2%. Gypsum ($CaSO_4$) at the rate of 500 kg ha^{-1} was incorporated into the soil at flowering stage by placement to supply calcium for development of pod and seed. Moisture stress imposed at 50-70 days after sowing. Foliar application was done once at 60 days after sowing. All plots were irrigated immediately after sowing, but subsequent irrigations were carried out according to the treatment and moisture stress impositions.

Plant height was measured from the base of the plant to the tip of the terminal bud from randomly labelled five plants in each net plot area.

Specific Leaf Area (SLA) is expressed as the ratio between leaf area to leaf dry weight. Five tetra foliate leaves (3rd fully expanded leaf from the top on the main axis) were collected from each treatment in each replication for calculating SLA. The collected leaves were cleaned and their leaf area was estimated using a leaf area meter (LICOR model-3100). They were dried in a hot air oven at 80°C for 48 hours and dry weight recorded.

$$SLA = \frac{A}{WL}$$

where,

A : Leaf area (cm^2 $plant^{-1}$)

WL : Leaf dry weight (g)

The cell membrane is the primary site of damage and it results into an increased leakage of solutes through the membrane under water stress conditions. Relative injury per cent was measured using third leaf from top of respective plants. One gram of fresh leaf sample was collected from the selected groundnut varieties and incubated in 10 ml of distilled water (known volume). After that light absorbance values were recorded at a wavelength of 273 nm (initial absorbance, Ia), using UV 1800 visible spectrophotometer. Then it transferred to hot water bath (100°C) for 15 minutes. Final absorbance values were recorded at 273 nm (final absorbance, Fa) using spectrophotometer and the cell leakage was calculated by following formula (Leopold *et al.,* 1981).

$$\text{Percent leakage (\%)} = \frac{Ia}{Fa} \times 100$$

where,

Ia : Initial absorbance

Fa : Final absorbance

Relative water content was used to evaluate the plant water status and it was measured at morning time. The second fully expanded leaf from the top of the main stem from each plot was taken at 50, 60 and 70 DAS. The samples were put immediately into ice box to prevent moisture loss. Fresh weight was measured once the samples were transported to the laboratory and then the leaflets were immersed into distilled water for 8 h to determine saturated leaf weight. The leaflets were transferred into paper bags and oven dried at 80°C for 48 h or until constant dry weight. Finally, RWC was determined using the formula suggested by Turner (1986).

$$\text{RCW (\%)} = \frac{\text{Fresh weight - Dry weight}}{\text{Turgid weight - Dry weight}} \times 100$$

Chlorophyll stability index is defined as the heat stability of chlorophyll under stress conditions. 0.1 g of fresh leaf sample was collected from the selected groundnut varieties and placed in test tubes and heated it in a water bath for 60 min at a temperature of 65 °C. Added 10 ml of dimethyl sulfoxide (DMSO) solution to treated and untreated samples. Respective checks samples are also maintained without imposing heat treatment. Both treated and untreated test tubes were kept for overnight and the chlorophyll is assessed by reading the optical density at 663 nm and 645 nm.

The CSI of the leaf sample were calculated using the following formula:

CSI (%) =

$$\frac{\text{Total chlorophyll of heated sample}}{\text{Total chlorophyll of unheated sample}} \times 100$$

At final harvest stage, pod yield and yield components were obtained from each plot. The pods were separated for sun-dried to approximately 8 per cent moisture content and pod dry weight was determined. Pods were shelled. Yield components such as 100 kernel weight, shelling percentage were recorded. Shelling percent was calculated using the following formula,

$$\text{Shelling (\%)} = \frac{\text{Seed weight}}{\text{Pod weight}} \times 100$$

Significance was tested by comparing "F" value at 5 per cent level of probability. Correlation studies were undertaken for different parameters of growth analysis, yield attributes and biochemical parameters in SPSS 20 software.

RESULTS AND DISCUSSION

Plant height

Plant height is an important aspect of the ecology of a plant species. The benefit of height is pre-emptive access to light. The plant height was gradually increased till harvest. Though significant difference was not observed between the varieties with respect of plant height, var. Dharani recorded numerically higher plant height at 65, 80 and harvest viz. (20.67; 23.65; 24.67 cm respectively). Maximum plant height (22.48 cm) was recorded in irrigated control plots, followed by K_2SiO_3 @ 0.4% (19.98 cm) followed by K_2SiO_3 @ 0.2% (19.97 cm) followed by Salicylic acid @ 100 PPM (19.58 cm) and the lowest value (18.40 cm) recorded in control stress. At harvest stage, plants attained maximum height and treatments followed the same manner (Table 1). The interaction of control irrigated in combination with Dharani was observed to have maximum plant height (26.53 cm) followed by potassium silicate @ 0.4% (25.77 cm) with Dharani. The minimum plant height recorded in the control stress in combination with K-6 (21.80 cm). It may due to the capability of silicon to maintain the plant water status by reducing transpiration through the formation of silicon-cuticle double layer on the leaf epidermis. Silicon nutrition may improves light receiving posture of the plants thereby stimulates the growth and photosynthetic capacity in plants. The finding was in line with Fernando and Libia (2018) that Si supplied at low dosages, helped to improve growth by stimulating different molecular, biochemical, and physiological mechanisms.

Specific Leaf Area

The Specific leaf area is often considered as an indirect measure of leaf expansion. Higher SLA indicates higher leaf area per unit biomass and larger surface area for transpiration. On the other hand, if SLA is higher, lower will be the leaf thickness and hence low photosynthetic capacity. Several scientists reported that low and moderate SLA is preferred by any crop under any environment where water use efficiency is important.

Maximum SLA (165.57 $cm^2\ g^{-1}$) was observed at 70 DAS in control irrigated then followed by K_2SiO_3 @ 0.4% (153.35 $cm^2\ g^{-1}$) followed by K_2SiO_3@ 0.2% (153.28 $cm^2\ g^{-1}$), Salicylic acid @ 100 PPM (146.66 $cm^2\ g^{-1}$) and minimum SLA value (136.28 $cm^2\ g^{-1}$) observed in control stress. The interaction of Dharani and control irrigated showed the maximum SLA (166.35 $cm^2\ g^{-1}$) followed by K_2SiO_3 @ 0.4% (156.19 $cm^2\ g^{-1}$) with Dharani (Table 2.). Reddy *et al*. (2000) reported that SLA was higher under adequately irrigated treatment compared to simulated drought treatment in groundnut due to water deficit may have influenced leaf thickness by increasing number of chlorenchyma cells and chloroplasts per unit leaf surface area. Thicker leaves (lower SLA) usually have higher chlorophyll per unit leaf area and hence have a greater photosynthetic capacity compared with thinner leaves.

Table 1. Effect of Salicylic acid and Silicon on plant height (cm) of groundnut under moisture stress conditions

Treatment	20 DAS			35 DAS			50 DAS			65 DAS			80 DAS			Harvest		
	Dharani	K-6	Mean	Dharani	K-6	Mean	Dharani	K-6	Mean	Dharani	K-6	Mean	Dharani	K-6	Mean	Dharani	K-6	Mean
T_1	7.36	6.20	6.78	8.10	8.33	8.22	20.53	18.23	19.38	23.67	21.30	22.48	25.60	25.33	25.47	26.53	26.37	26.45
T_2	6.20	6.00	6.10	7.37	7.23	7.30	19.20	16.03	17.62	20.03	19.57	18.40	21.47	21.70	21.59	22.50	21.80	22.15
T_3	6.16	5.83	6.00	7.60	7.23	7.42	18.37	15.27	16.82	20.50	19.37	19.94	22.70	23.77	23.24	23.37	24.97	24.17
T_4	5.93	6.53	6.23	7.70	7.50	7.60	18.83	15.30	17.07	19.50	20.43	19.97	24.40	22.87	23.64	24.67	25.43	25.05
T_5	6.16	5.53	5.85	7.67	7.13	7.40	18.97	17.50	18.24	21.43	18.53	19.98	24.50	24.57	24.54	25.77	25.43	25.60
T_6	6.16	6.03	6.10	7.87	7.73	7.80	17.60	15.23	16.42	20.43	18.73	19.58	23.47	24.63	24.05	25.23	24.64	24.92
T_7	6.23	6.03	6.13	7.80	7.87	7.84	19.17	15.03	17.10	19.50	20.43	19.22	23.13	23.27	23.20	24.27	24.03	24.19
T_8	5.76	6.33	6.05	8.07	7.13	7.60	18.17	14.80	16.49	19.20	17.80	18.50	23.50	23.07	23.29	24.47	23.90	24.15
Mean	6.24	6.06	6.15	7.77	7.51	7.64	18.85	15.92	17.39	20.67	19.19	19.93	23.65	23.59	23.62	24.67	24.29	24.58
	V	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**
CD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.22	2.10	NS	0.68	0.81	NS	1.11	0.33

Table 2. Effect of Salicylic acid and Silicon on specific leaf area ($cm^2\ g^{-1}$) of groundnut under moisture stress conditions

Treatment	50 DAS			60 DAS			70 DAS		
	Dharani	K-6	Mean	Dharani	K-6	Mean	Dharani	K-6	Mean
T_1 : Control (Irrigated)	131.85	131.79	131.82	160.52	154.01	157.27	166.35	164.79	165.57
T_2 : Control (Stress)	130.46	130.78	130.62	129.82	126.37	126.50	138.83	133.72	136.28
T_3 : Water spray	130.87	131.14	131.005	130.33	130.05	130.19	142.61	140.41	141.51
T_4 : Potassium silicate @ 0.2%	130.91	131.96	131.435	141.25	139.23	140.24	152.68	153.87	153.28
T_5 : Potassium silicate @ 0.4%	131.17	131.10	131.135	141.29	140.36	140.83	156.19	150.51	153.35
T_6 : Salicylic acid 100 PPM	130.83	131.22	131.025	136.19	138.02	137.11	142.52	150.79	146.66
T_7 : Salicylic acid 200 PPM	130.52	130.24	130.38	130.70	133.09	131.90	141.42	141.02	141.22
T_8 : Kcl @ 0.2%	130.26	130.31	130.285	128.62	124.37	126.50	138.61	140.85	139.73
Mean	131.06	130.85	130.96	138.09	136.68	137.39	147.40	146.99	147.20
	V	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**
CD	NS	NS	NS	NS	3.72	2.66	NS	2.91	3.30

Relative injury

High temperature disrupts cellular membrane integrity by weakening the hydrogen bonds and electrostatic interactions between the polar groups of proteins. It has shown that leaching of inorganic solutes was the result of disruption of membrane structure caused by denaturation of membrane proteins and melting of membrane lipids under high temperature stress. The lowest value of membrane injury (9.64%) was observed in control irrigated followed by K_2SiO_3 @ 0.4% (9.96%) followed by K_2SiO_3 @ 0.2% (10.31%), Salicylic acid @ 100 PPM (10.33%) and maximum value (13.33%) observed in control stress (Table 3.). The interaction showed that Dharani with irrigated control recorded the best, less membrane injury. The maximum was recorded in the treatment control stress in combination with K-6 (10.41%). Talwar *et al.* (2002) reported in groundnut, relative injury increased with increase in temperature. This is because at lower temperature the RI was too low to cause substantial electrolyte leakage in a reasonable time.

Relative water content

The values of relative water content are often considered as the appropriate measure of plant water status and considered to be the sensitive index of plant water content especially when plants are exposed to cellular water deficit conditions. Relative water content ranging from 86.98 to 92.73 in irrigated conditions prior to moisture stress and later respectively (Table 4.). Potassium silicate @ 0.4% showed the best result. Control irrigated in combination with Dharani variety was the best interaction. Silicon, when polymerized, reduces the flexibility of the stomatal walls and thus, the stomata tend to remain closed. As a consequence of the stomatal closure, transpiration and water loss decrease. It may leads the plant to maintain its water Hence, these treatments can be well fitted under moisture stress condition, as they were able to maintain higher tissue water status inspite of early season environmental stresses. This deviation in RWC may be attributed to differences in the ability of the variation to absorb more water from the soil and or the ability to control water loss through the stomata. The finding was in the line of Jian (2005), silicon alleviated water stress by decreasing transpiration occurs mainly through the stomata and partly through the cuticle.

Chlorophyll stability index

The chlorophyll stability index is an indication of the heat stress tolerance capacity of plants. CSI leads to increased photosynthetic rate, more dry matter production and higher productivity. Hence, a high CSI value indicates the less effect of temperature stress on chlorophyll content of plants. Drought stress caused a reduction in CSI however, the silicon applied plants had a higher CSI under water deficit conditions (Table 5).

The present study showed that CSI values varied from 85.54 to 81.75 in watered condition while in stress 82.49 to 51.57. The best combination was variety Dharani along with irrigated conditions and potassium silicate showed the best result among treatments. The foliar application of silicon helps plant to with stand under stress through better availability of chlorophyll. This leads to increased photosynthetic rate, more dry matter production and higher productivity. Burman *et al.* (2011) reported the same findings that in pearl millet, water deprivation decreased plant water potential and RWC that led to a significant decline in rate of net photosynthesis, chlorophyll content, stomatal conductance, chlorophyll fluorescence and grain yield.

Yield and Yield components

Groundnut has grown under irrigation gave a significantly higher pod yield. Maximum value (2644 kg ha^{-1}) was observed in control irrigated followed by potassium silicate @ 0.4% (2493 kg ha^{-1}) and minimum value (1088 kg ha^{-1}) observed in control stress. In interaction , Dharani with water condition was observed maximum pod yield (2648 kg ha^{-1}) followed by Potassium silicate @ 0.4% (2497 kg ha^{-1}) with Dharani and minimum value (1102 kg ha^{-1}) was observed in control stress with K-6 (Table 6). This is due to possible decrease in leaf area and stomatal conductance resulting in loss of dry matter accumulation which explains the decrease in yield and yield components under water stress.

Jayabal *et al.* (1999) reported that foliar application of micronutrients to a crop were effectively absorbed and translocated to the developing pods, producing more number of pods and better filling in soybean. Silicon is mainly deposited in the cell wall, increasing the stiffness of the cells, an effect attributed to Silicon deposition as solid amorphous silica, and has a direct effect on water relations in plants which may have benefited plants of soybean, resulting in the increase in photosynthesis.

Table 3. Effect of Salicylic acid and Silicon on relative membrane injury (RI) (%) of groundnut under moisture stress conditions

Treatment	50 DAS			60 DAS			70 DAS		
	Dharani	K-6	Mean	Dharani	K-6	Mean	Dharani	K-6	Mean
T_1 : Control (Irrigated)	7.23	7.14	7.19	10.02	12.36	11.19	9.57	9.71	9.64
T_2 : Control (Stress)	7.15	7.15	7.15	16.37	12.94	14.10	16.26	10.41	13.33
T_3 : Water spray	7.11	7.15	7.13	10.57	11.82	11.76	10.25	9.85	10.05
T_4 : Potassium silicate @ 0.2%	7.14	7.14	7.14	12.03	11.67	11.85	10.20	9.79	10.31
T_5 : Potassium silicate @ 0.4%	7.14	7.13	7.14	11.58	11.45	11.52	9.86	10.05	9.96
T_6 : Salicylic acid 100 PPM	7.13	7.14	7.14	12.49	12.14	12.32	10.84	9.81	10.33
T_7 : Salicylic acid 200 PPM	7.11	7.11	7.11	12.07	11.23	11.65	10.65	9.11	9.88
T_8 : Kcl @ 0.2%	7.15	7.11	7.13	12.88	11.10	11.99	11.47	9.53	10.50
Mean	7.14	7.13	7.14	12.25	11.83	12.04	11.13	9.78	10.5
	V	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**
CD	NS	NS	NS	NS	2.07	1.51	NS	2.16	1.84

Table 4. Effect of salicylic acid and silicon on relative water content (%) of groundnut under moisture stress conditions

Treatment	50 DAS			60 DAS			70 DAS		
	Dharani	K-6	Mean	Dharani	K-6	Mean	Dharani	K-6	Mean
T_1 : Control (Irrigated)	86.11	87.85	86.98	93.06	91.92	92.49	92.34	93.11	92.73
T_2 : Control (Stress)	85.20	86.16	85.68	65.22	83.03	74.13	70.52	74.36	72.44
T_3 : Water spray	87.32	88.21	87.77	75.43	79.36	77.40	74.91	78.90	76.91
T_4 : Potassium silicate @ 0.2%	85.75	86.15	85.95	76.78	79.26	78.02	80.22	83.35	81.79
T_5 : Potassium silicate @ 0.4%	85.87	84.13	85.00	75.21	87.76	81.49	86.21	78.81	82.51
T_6 : Salicylic acid 100 PPM	87.20	87.35	87.28	79.57	75.45	77.51	74.46	80.76	77.61
T_7 : Salicylic acid 200 PPM	85.22	84.74	84.98	76.58	77.40	76.99	74.58	78.17	76.38
T_8 : Kcl @ 0.2%	83.47	82.51	82.99	76.45	77.34	76.90	75.95	76.15	76.05
Mean	85.89	85.77	85.83	81.44	77.28	79.36	80.45	78.64	79.55
	V	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**
CD	NS	NS	NS	NS	9.02	5.85	NS	4.49	3.92

Table 5. Effect of salicylic acid and silicon on chlorophyl stability index (%) of groundnut under moisture stress conditions

Treatment	50 DAS			60 DAS			70 DAS		
	Dharani	**K-6**	**Mean**	**Dharani**	**K-6**	**Mean**	**Dharani**	**K-6**	**Mean**
T_1 : Control (Irrigated)	86.11	84.96	85.54	82.34	80.97	81.66	82.24	81.25	81.75
T_2 : Control (Stress)	83.56	81.42	82.49	51.32	50.66	50.99	61.49	41.64	51.57
T_3 : Water spray	85.97	86.54	86.26	51.23	52.37	51.80	55.22	62.30	58.76
T_4 : Potassium silicate @ 0.2%	84.09	85.34	84.72	55.95	53.45	54.70	64.61	61.15	63.02
T_5 : Potassium silicate @ 0.4%	81.48	85.44	83.46	56.92	52.63	54.78	64.88	64.76	64.69
T_6 : Salicylic acid 100 PPM	84.64	82.16	83.40	51.73	53.16	52.45	63.59	61.30	62.45
T_7 : Salicylic acid 200 PPM	82.50	81.76	82.13	52.69	51.50	52.10	61.33	61.75	61.54
T_8 : Kcl @ 0.2%	80.80	81.14	80.97	51.07	51.26	51.17	51.97	51.66	51.82
Mean	83.64	83.59	83.62	56.65	55.75	56.20	63.16	60.72	61.95
	V	**T**	**V × T**	**V**	**T**	**V × T**	**V**	**T**	**V × T**
CD	NS	NS	NS	NS	1.56	1.59	NS	6.99	6.75

Table 6. Effect of salicylic acid and silicon on yield & yield components of groundnut under moisture stress conditions

Treatment	Shelling (%)			Pod yield (kg ha^{-1})		
	Dharani	**K-6**	**Mean**	**Dharani**	**K-6**	**Mean**
T_1 : Control (Irrigated)	72.10	64.44	68.27	2640.00	2648.89	2648.89
T_2 : Control (Stress)	66.27	62.26	64.27	1075.56	1102.22	1093.33
T_3 : Water spray	66.65	62.92	64.79	1200.00	1244.44	1226.67
T_4 : Potassium silicate @ 0.2%	69.40	63.66	66.53	1315.56	1253.33	1288.89
T_5 : Potassium silicate @ 0.4%	68.76	66.66	67.71	2497.78	2488.89	2497.78
T_6 : Salicylic acid 100 PPM	62.80	69.63	66.22	1235.56	1226.67	1235.56
T_7 : Salicylic acid 200 PPM	63.94	66.00	64.97	1253.33	1200.00	1226.67
T_8 : Kcl @ 0.2%	65.18	65.76	65.47	1226.67	1146.67	1191.11
Mean	66.88	65.16	66.02	1555.55	1538.88	1551.11
	V	**T**	**V × T**	**V**	**T**	**V × T**
CD	NS	1.1	0.5	NS	242	334

Shelling Percentage (%)

Shelling percentage is an important yield component in groundnut. High Shelling percentage denotes high source-sink relation, which is desirable in groundnut. Dharani variety showed better shelling percentage compared to K-6. Among treatments, the value of shelling percentage varied from 68.27 to 64.27 per cent (Table 6).

This difference in shelling percentage among treatments may due to high water use efficiency and photosynthesis. In groundnut, shelling percentage was decreased due to stress at pegging to pod development stage (Patel and Golakiya, 1988)

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