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Effect of Electroculture an *Arachis hypogaea* (L)

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Abstract

Experiments were carried out to study effect of electrictroculture on Groundnut, during these experiments response of groundnut to 3V, 6V and 9V electricity was studied.It was found that various growth parameters like Height of plant, Number of elongation pegs, Number of leaves had shown significant response to the application of electricity. Yield Parameters like Number of pods per plant, Hundred seed weight, Seed size, Estimated weight was significantly increased due to application of electricity. Nutritional value of the groundnut seed was also studied plant applied with 3V and 9V electricity had shown decrease in fat percentage.There was no significant effect on fibre, Carbohydrate and protein percentage of groundnut seeds. Post-harvest soil estimation showed that majority of soil components were recorded in large quantity in experimental fields than the control field. Thus application of electricity was helpful in the retention of soil components.

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Keywords

Electroculture, Growth parameters, Yield Parameters Soil composition, Arachishypogaea.

Introduction

Electroculture is a technique that uses electricity to improve seed germination, plant growth, quantity and yield. This technique is found useful to protect plants from disease and pastes. Electromagnetic field influence physiological activity (Jaffe and Nuccitelli, 1977).

It is found that electroculture influence root growth (Souda *et al.*,1970) the electric current also change the growth direction (Wanget *et al.*,1989),(Filek *et al.*,2003), enhance or inhibit flowering and stimulate embryogenesis(Dijak *et al.*,1986) seed germination (Borisov, 1994;Yalgared M *et al.*,2003;Panarese, 2009; Patil, 2018: Bhagyawant and Patil, 2021).Zhurbitskii and Shidlovskaya (1967) studied effect of electricity on uptake of irons in a solution that can affect absorption and incorporation of heavy metal iron such type of results also reported by Murr1964; Kotaka *et al.*, 1965; Krueger *et al.*, 1994.

Groundnut is one of the major oil-yielding crops, it is widely grown in the tropic and subtropic countries of the world. It is cultivated in 108 countries on about 22.2 million hectares In India it is cultivated about8 million hectares area. But due to high production cost and low productivity percentage area under cultivation of groundnut is decreasing. Present investigations are deals with the study of effect of electroculture on growth parameters, Yield parameters, Nutritional value, Soil component and oil percentage of the Groundnut.

Materials and Methods

Experiment was carried out in the field located at Sonpeth Dist. Parbhani(19°1'34''N latitude and

76°28'18''E longitude at the elevation of 437m above the sea level). The experiment was conducted in complete randomized block designs. The field was prepared for sowing by following standard pre-sowing activities. The experimental field was divided into four equal plots of 10'x10' size. Three plots were supplied with3V, 6V and 9V electricity, one plot was used as control. All the parameters except electricity was kept constant in all the fields.

Seeds were sown following standard method for groundnut cultivation. In experimental plots seeds were sown in between two electrodes. Each electrode was connected with the help of wire and finally it was connected to 3V/6V/9V DC(direct current)source of electricity.

Electricity treatment was given was given daily at morning (8am) for 10 min till harvesting.

Morphological and Yield parameters were studied ninety days after sowing. Height of the plant and length of root was measured in centimeters using scale and number of leaves, number of pegs, number of root nodules and number of pods were counted numerically. Seed size was measured by method describe by Wankhede *et al.*, (2019). Estimated yield was calculated quintal/acre by multiplying with 4.356 to the actual weight of pods yielded from the experimental plots.

Protein and fiber content of the seeds was estimated by the methods described by AOAC, for carbohydrate content estimated by method described by FAO while fat content was estimated by following IS 3579-1966 Reaffirmed 2016 method.

Soil samples were analyzed before sowing and after harvesting by methods described by FAO 2008.

The observations were recorded and tabulated in tables. Data was analyzed statistically using ANOVA.

Results and Discussion

Growth Parameters

Number of leaves per plant was increased significantly with the application of electricity. Maximum number of leaves (133.76) per plant was recorded in plants applied with 3V electricity; it is followed by plants applied with 6V electricity (110.64) and 9V (106.08).Control showed less number of leaves (66.72) similar results was found by Gabdrakhmanova D and Qussiny, C (2011) in sweet pepper, Kanimarani (2018) in Cowpea cultivars and Afrasiyab *et al.*, (2020) in Chickpea.

In Control height of the plant was (28.77cm), application of electricity to the plants increased height of the plants. It was maximum in the plants applied with 3V electricity (34.18cm) followed by the plant applied with 9V electricity(31.12cm). The plants applied with 6V electricity showed an increase in the height of plant but it was statically non-significant. Increased height due to application of electricity may be due to increased cell division or cell elongation as a result of increased Gibberellins. Similar results were recorded by Dayal *et al.*, (1983) in tomato; Lakshmappa *et al.*, (2011) in wheat, bengal gram, green gram and moth bean; Laith Mohammad Shamma (2012) in faba bean.

Application of electricity increased root length in groundnut but these this increase in root length was statistically non-significant in plants applied with 3V and 6V electricity. Root length was maximum in plants applied with 9V electricity 54.02cmwhich was significant at P = 0.05.

In groundnut elongation pegs are produced after fertilization. The number of pegs per plant increased with the application of electricity the maximum number of pegs per plant were recorded in plants applied with 9Velectricity (74.80) followed by the plants applied with 3V (67.7) and 6V (63.70) electricity. In control it was (56.40).

This increase in the number of pegs per plants due to application of electricity was statistically significant. This increase in the number of pegs indicates increased pollination due to application of the electricity.

Number of root nodules per plant was increased due to application of3 V electricity (51.90) followed by the plant with the 9 Vs (48.70). It was decreased (43.50) due to application of 6 Vs electricity. But this change in the number of root nodules per plant was statistically non-significant. Thus application electricity has no significant role on root nodulation.

Seed size (l × b × t) in control was (241.39mm). The plants applied with 6Velectricity showed maximum seed size (393.02mm) followed by plants applied with 9V (346.00mm) and 3 V (310.91mm) electricity. Electricity has played important role to increase seed size, it was statistically highly significant.

Table.1 Effect of Electroculture on Growth Parameters of Groundnut plant

Character	Control	3 V	6V	9V	SE	CD 5%	CD1%
Number of leaves	66.72	133.76**	110.64**	106.08**	12.42	24.84	33.04
Height of plant (Cm)	28.77	34.18**	30.67^{NS}	31.12*	1.35	2.69	3.58
Length of root (Cm)	29.83	38.46^{NS}	38.92^{NS}	54.02*	10.35	20.71	27.54
No of peg	56.40	67.7**	63.70*	74.80**	3.36	6.88	9.29
No of root nodules	48.70	51.90^{NS}	43.50^{NS}	48.70^{NS}	3.41	7.00	9.45

Table.2 Effect of Electroculture on Yield Parameters of Groundnut plant

Character	control	3 V	6V	9V	SE	CD 5%	CD1%
Number of pods/plant	40.44	64.64*	40.44^{NS}	52.84*	3.27	6.54	8.70
100 seed weight (gm)	43.57	50.32*	49.28^{NS}	55.24*	2.07	6.59	12.11
Seed size (length) mm	12.76	13.32^{NS}	14.12**	13.18^{NS}	0.31	0.63	0.84
Breadth(b) mm	8.24	8.86**	9.66**	9.29	0.24	0.48	0.64
Thickness(t) mm	7.19	7.97**	8.41**	8.46**	0.24	0.49	0.65
(l×b×t)	241.39	310.91**	393.02**	346.00**			
Estimated yield (Quintal/Acre)	22.99	41.94*	23.08^{NS}	32.67^{NS}	3.93	12.8	22.93

Table.3 Effect of Electroculture on Nutritional Value of Groundnut seeds.

Nutrient	Control	3V	6V	9V	SE	CD5%	CD1%
Total fiber (%)	8.19	10.57^{NS}	7.72^{NS}	17.38*	1.93	6.13	11.27
Total carbohydrate (%)	16.01	11.35^{NS}	16.01^{NS}	14.32^{NS}	0.95	3.03	5.56
Total protein (%)	26.73	31.89^{NS}	27.09^{NS}	22.05^{NS}	1.74	5.54	10.17
Total fat (%)	46.9	43.96*	47.21^{NS}	43.73*	0.81	2.56	4.70

*significant at p=0.05;**significant at p=0.01; NS-non significant

Table.4 Effect of Electroculture on Soil Components

Sr. No.	Nutrient	Pre-Sowing	Post-Harvest			
			CONTROL	3V	6V	9V
1	Nitrogen (Kg/ha)	188.16	150.33	213.25	163.07	125.44
2	Phosphorous (Kg/ha)	8.51	61.44	103.67	92.04	101.43
3	Potassium (Kg/ha)	873.6	599.20	862.40	752.64	976.64
4	Calcium (meq %)	30.77	31.49	34.56	26.88	30.72
5	Magnesium (meq %)	21.43	4.28	5.95	9.52	3.57
6	Sulphur (ppm)	67.5	292.00	277.00	281.00	209.00
7	Copper (ppm)	1.134	8.674	10.566	11.302	11.618
8	Iron (ppm)	0.260	1.209	0.190	0.205	0.205
9	Zinc (ppm)	0.346	0.426	1.084	0.926	0.998
10	Molybdenum (ppm)	0.094	0.097	0.105	0.077	0.075

Number of pods per plant increased with the application of electricity, maximum number of pods per plant(64.64) was recorded in plants applied with 3V electricity followed by the plants applied with 9V electricity (52.84) as compared to control(40.44) it was increased significantly. This might be due to stimulation of increased metabolism due to application of electricity. Similar results were recorded by Lakshmappa (2011) in Bengal gram, green gram and moth bean, Laith Mohmmed Shamma (2012) in faba bean.

Weight of 100 seeds was measured, in control it was (43.57gm). The application of electricity increased seed weight. Maximum weight of seeds(55.24gm) was found

in plants applied with 9V electricity followed by the plant applied with 3V electricity (50.32gm) and 6Velectricity (49.28gm).

Increase in the 100 seeds weight was highly significant in plants applied with 3V and 9V electricity while increase in seed weight was in plants applied with 6V electricity was statistically non-significant.

Total yield (q/acre) was increased with the application of electricity; the plants applied with 3V electricity gave maximum yield (41.94q/acre) which was statistically significant. In plants applied with 9V electricity and 6V electricity yield was 32.67 q/acre and32.08 q/acre respectively though it was increased it was statistically non significant.

As there was increase in the number of pods, 100 seeds weight and seed size significantly due to application of 3V electricity yield was also significant in the same field. Similar results were found in Francis *et al.*, (1989) in sunflower; Lale *et al.*, (2004) in cotton, Georgiy (2013) in wheat, barley and sugar beet, and Patil (2018) in *Raphanus*.

Nutritional analysis of groundnut seeds belonging to each field was carried out in order to study effect of electricity on nutritional value of groundnut. It was found that electricity has role to change carbohydrate and protein percentage of groundnut but it was statistically non-significant.

Application of 9V electricity increased fiber content total fat% significantly while application of 3V and 9V electricity decreased fat percentage in groundnut seeds significantly. As chemicals are consumed and released by the plants in its rhizosphere, cultivation of plants result in to the change in the soil nutrients.

Efforts were made to study effect of electricity on the soil nutrients in groundnut cultivated field. Before sowing 188.16 kg/ha soil nitrogen was present. Post-harvest soil estimation from the field applied with 3V electricity showed 213.25kg/ha nitrogen followed by field applied with 6V electricity 163.07kg/ha which was greater than the control(150.53kg/ha).

Thus application of electricity may have increased more nitrogen fixation in the soil. Same effect was seen on the majority of soil components. Thus application of electricity was helpful in the retention of soil components.

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