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## Effect of different irrigation scheduling & mulching on productivity of groundnut (*Arachis hypogaea* L.) of east & south eastern coastal plain of Odisha

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#### Abstract

A field experiment was carried out during Rabi season 2017 at the Agrometeorological research farm of College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar to evaluate the adequate effect of irrigation & mulching on groundnut (*Arachis hypogaea* L.) productivity. The experiment was laid out in split plot design with three irrigation levels (I<sub>1</sub>- Irrigation on 25, 45 & 70 DAS, I<sub>2</sub>- Irrigation on 25 & 45 DAS & I<sub>3</sub>- Irrigation on 25 & 70 DAS) as main plots whereas mulching (M<sub>1</sub>- Mulching with paddy straw, M<sub>2</sub>- Mulching with FYM @ 5t/ha & M<sub>3</sub>- No mulch) as sub plots consisting of three replications. I<sub>1</sub>-Irrigation on 25, 45 & 70 DAS produced highest plant height (57.4cm), more number of pods/plant (14.7), number of seeds/plant (24.2) and dry weight of seeds/plant (9.7gm) whereas more dry weight of pods/plant (14.1gm), fresh weight of pods/ha (2303kg/ha), yield (1161kg/ha), biological yield (8287kg/ha) and harvest index (14.15%) were recorded significantly in treatment I<sub>3</sub>- Irrigation on 25 & 70 DAS. In M<sub>2</sub>- Mulching with FYM @ 5t/ha recorded highest in number of pods/plant (14.8), dry weight of pods/plant (14.5gm), number of seeds/plant (22.3), dry weight of seeds/plant (10.3gm), fresh weight of pods/ha (2303kg/ha), yield (1124kg/ha), biological yield (8505kg/ha) and harvest index (13.45%) whereas M<sub>1</sub>- Mulching with paddy straw recorded highest plant height (59.0cm).

**Keywords:** groundnut, irrigation level, mulching materials, groundnut yield

#### Introduction

Oilseed crops are the economic backbone of agricultural produce in India. Groundnut (*Arachis hypogaea* L.) is an important oilseed and supplementary food crop of India. Groundnut is the fourth most important crop in case of edible oil (46-51%) and third most important crop in case of source of vegetable protein (26%). On equal basis groundnuts contain more protein than meat and two and half times more than eggs. Groundnuts are a good source of calcium, phosphorus, iron, zinc and boron. The groundnuts also contain vitamin E and small amounts of vitamin B complex and high in calories. Due to these properties Groundnut is known as 'King of oilseeds'. During 2014-15 among major oilseed crops of India groundnut ranks first for accounting 42% oilseed production in the country (Datarkar *et al*, 2015) [3]. Gujarat is the largest producer of the total groundnut production contributing 25 per cent followed by Andhra Pradesh, Tamil Nadu and Karnataka (Lokapur *et al*, 2014) [10]. In India it occupies an area of 4769 thousand ha producing 7402 thousand tonnes with an average yield of 1552 kg ha<sup>-1</sup>. Odisha occupies an area of 49 thousand ha producing 62 thousand tonnes with an average yield of 1268 kg ha<sup>-1</sup>. (Directorate of Economics & Statistics, DAC&FW, 2014-15).

Well drained, light coloured, loose, friable, sandy loam soil, well supplied with calcium and a moderate amount of organic matter rich soil is ideal for growing of Groundnut. Temperature is an important factor in determining the flowering, pod initiation and pod setting. The optimum temperature for vegetative growth of groundnut is 26-30°C, maximum reproductive growth at 24-27°C temperature and 30-34°C is best for pods development. Temperature below 20°C affects flowering and the ratio of fertilized flowers. 50 to 125 cm of well distributed rainfall is required for growth and yield of groundnut. Rainfed groundnut constitutes more than 90% of the total groundnut crop coverage area. For proper germination, good plant stand, normal vegetative growth, increased flowering and for proper pod development adequate irrigation is required.

Irrigation is a critical input for groundnut production in India as well as Odisha. Scientific manner scheduling of irrigation to the crop is given for the efficient utilization of applied water (Damodaram and Hegde, 2000) [2]. Thus drip irrigation is applied for optimization

Of water requirement and for increasing productivity. Irrigation is done mechanically in Odisha. Hence, mulching is an important factor for the growth and production of groundnut. Though the crop doesn't have to dependant on monsoon, mulching helps in the off monsoon season. At the time of sowing initial rise in temperature increases soil temperature by 4-5°C hence, mulching helps in faster germination by converting solar energy into heat energy at the rhizosphere. Mulching conserves moisture during evaporation from the soil in high temperature, check weed growth and gives maximum yield. Hence the present research was undertaken to scrutinize the effect of irrigation and organic mulches on productivity of groundnut.

### Materials and Methods

The field experiment was conducted at the Agro meteorological research farm of College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar during Rabi 2017. The experimental site was almost uniform with well-drained, sandy loam soil, well supplied with calcium and a moderate amount of organic matter. The experiment was laid out in Split plot design with three replications and the details of the treatments are;

#### Main plot

Three irrigation levels

I<sub>1</sub>- Irrigation on 25, 45 & 70 DAS

I<sub>2</sub>- Irrigation on 25 & 45 DAS

& I<sub>3</sub>- Irrigation on 25 & 70 DAS

#### Sub plot

Three types of mulching

M<sub>1</sub>- Mulching with paddy straw

M<sub>2</sub>- Mulching with FYM @ 5t/ha

& M<sub>3</sub>- No mulch

Variety- Devi with spacing 45 cm x 10 cm

### Results and Discussion

#### Effect of different irrigation on Groundnut productivity

The data (table-1 and table-2) clearly revealed that irrigation I<sub>3</sub>- irrigation on 25 & 70 DAS was found best followed by I<sub>1</sub>- Irrigation on 25, 45 & 70 DAS and I<sub>2</sub>- Irrigation on 25 & 45 DAS. At harvesting stage the maximum plant height of groundnut (57.4cm) was found in I<sub>1</sub> (irrigation on 25 & 70

DAS) followed by I<sub>2</sub> (Irrigation on 25 & 45 DAS) (57.0cm) and I<sub>3</sub> (irrigation on 25 & 70 DAS) (55.9cm) respectively. The increase in plant height may be due to the application more irrigation. The finding is as similar as the findings of Pal *et al.* (1996) and Mishra, (1997).

Maximum dry weight of pods/plant (14.1gm/plant), fresh weight of pods (2303kg/ha), dry weight of pods or yield (1161/ha), biological yield/ ha (8287/ha) and harvest index (14.15%) were recorded in treatment I<sub>3</sub> (irrigation on 25 & 70 DAS) at harvesting stage followed by I<sub>1</sub> & I<sub>2</sub> (table-1). These findings are in agreement with the results reported by Reddy *et al.* (1980) [1], Reddy *et al.* (1980) [1], Sounda *et al.* (2006) [16] and Khonok *et al.* (2015) [9]. In I<sub>1</sub> (Irrigation on 25, 45 & 70 DAS) recorded lowest dry weight of pods/plant, fresh weight of pods, dry weight of pods or yield, biological yield/ ha and harvest index may be due to more the number of irrigations and higher the quantity of water over and above the requirement did not result in a corresponding increase in the yield of groundnut. It was as same as the findings of Geethalakshmi *et al.* (1994) [7].

The no. of pods (14.7/plant), no. of seeds (24.2/plant) and dry weight of seeds (9.2gm/plant) were found maximum in I<sub>1</sub> (irrigation on 25, 45 & 70 DAS) followed by I<sub>3</sub> & I<sub>2</sub> respectively. Earlier similar findings were recorded by Reddy *et al.* (1982) [1].

#### Effect of different mulching materials on Groundnut productivity

Maximum plant height (59.0cm) was recorded in M<sub>1</sub> (Mulching with paddy straw) (table-1). This finding was as same as the findings of Dutta (2006) and Taufiq *et al.* (2017). Similarly, maximum fresh weight of pods (2303kg/ha), dry weight of pods or yield (1124kg/ha), biological yield (8505kg/ha), harvest index (13.45%), no. of pods (14.8/plant), dry weight of pods (14.5gm/plant), no. of seeds (22.3/plant) and dry weight of seeds (10.3gm/plant) were recorded maximum in M<sub>2</sub> (Mulching with FYM @ 5t/ha) at harvesting stage followed by M<sub>1</sub> & M<sub>3</sub> (table-1 and table-2). This finding is also in agreement with the findings of Singh and Singh (2000) [15], Goverdhan and Ramanjaneyulu (2016) [8]. According to Dharma (1996) [4] it was found that the activities of microorganisms that make the plant nutrients readily available to the crops might be stimulated by FYM.

**Table 1:** Yield attributing characters influenced by different irrigation scheduling & mulching

Treatments	Plant Height	Fresh Weight of Pods(kg)/Ha	Dry Weight of Pods(kg)/Ha (Yield)	Biological Yield(kg)/ Ha	Harvest Index (%)
<b>Irrigation</b>					
I <sub>1</sub> - Irrigation on 25, 45 & 70 DAS	57.4	2116	1022	8048	12.97
I <sub>2</sub> - Irrigation on 25 & 45 DAS	57	2100	1010	8043	12.53
I <sub>3</sub> - Irrigation on 25 & 70 DAS	55.9	2303	1161	8287	14.15
SE(m)±	1.34	37.85	25.26	124.71	0.23
CD at 5%	5.26	148.55	99.17	489.54	0.91
CV%	7.1	5.23	7.1	4.6	5.3
<b>Mulching</b>					
M <sub>1</sub> - Mulching with paddy straw	59.0	2001	1017	7847	13.02
M <sub>2</sub> - Mulching with FYM @ 5t/ha	52.7	2303	1124	8505	13.45
M <sub>3</sub> - No mulch	58.6	2214	1053	8026	13.18
SE(m)±	1.7	115.84	27.4	92.82	0.21
CD at 5%	5.3	356.88	84.3	285.97	0.64
CV%	9	16	7.7	3.4	4.7
Replication	NS	NS	NS	NS	NS
Irrigation	NS	S	S	NS	S
Mulching	S	NS	S	S	NS

**Table 2:** Effect of different irrigation scheduling & mulching on no. of pods/plant, dry weight of pods/plant, no. of seeds/plant & dry weight of seeds/plant

Treatments	No. of Pods/Plant	Dry Weight of Pods(g)/Plant	No. of Seeds/Plant	Dry Weight of Seeds(g)/Plant
<b>Irrigation</b>				
I <sub>1</sub> - Irrigation on 25, 45 & 70 DAS	14.7	13.7	24.2	9.7
I <sub>2</sub> - Irrigation on 25 & 45 DAS	12.7	12.5	20.0	8.4
I <sub>3</sub> - Irrigation on 25 & 70 DAS	13.8	14.1	21.7	9.5
SE(m)±	0.17	0.39	0.47	0.29
CD at 5%	0.65	1.53	1.83	1.13
CV%	3.6	8.7	6.4	9.39
<b>Mulching</b>				
M <sub>1</sub> - Mulching with paddy straw	13.3	12.8	21.5	8.3
M <sub>2</sub> - Mulching with FYM @ 5t/ha	14.8	14.5	22.3	10.3
M <sub>3</sub> - No mulch	13.1	13.0	22.1	8.9
SE(m)±	0.4	0.4	0.6	0.23
CD at 5%	1.3	1.4	2.0	0.71
CV at 5%	9.2	10.0	8.8	7.5
Replication	NS	NS	NS	NS
Irrigation	S	NS	S	NS
Mulching	S	S	NS	S

### Conclusion

Among the three irrigation scheduling, Irrigation on 25 & 70 DAS showed maximum dry weight of pods/plant (14.1gm/plant), fresh weight of pods (2303kg/ha), dry weight of pods or yield (1161/ha), biological yield/ ha (8287/ha) and harvest index (14.15%). Thus, the yield parameters were more in irrigation on 25 & 70 DAS than Irrigation on 25, 45 & 70 DAS and Irrigation on 25 & 45 DAS. Based on the above findings it was found that in *rabi* season, irrigation on 25 & 70 DAS obtained higher yield than Irrigation on 25, 45 & 70 DAS and Irrigation on 25 & 45 DAS. Mulching with FYM @ 5t/ha obtained maximum fresh weight of pods (2303kg/ha), dry weight of pods or yield (1124kg/ha), biological yield (8505kg/ha), harvest index (13.45%), no. of pods (14.8/plant), dry weight of pods (14.5gm/plant), no. of seeds (22.3/plant) and dry weight of seeds (10.3gm/plant) than Mulching with paddy straw and No mulch. Hence, it is concluded that in east & south eastern coastal plain of Odisha Irrigation on 25 & 70 DAS with Mulching with FYM @ 5t/ha gives higher groundnut productivity.

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