



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
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NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(7): 908-910
Received: 02-05-2026
Accepted: 08-06-2026

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Effect of drip irrigation scheduling and land configuration on growth of summer groundnut

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DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i7l.6037>

Abstract

A field experiment was laid out in split plot design replicated thrice comprising of four main plot treatments consisting 80% ET_C, 100% ET_C, 120% ET_C under drip irrigation and flood irrigation while three sub plot treatments consisting Flatbed, Broad Bed Furrow and Ridge & Furrow methods of land configuration. Irrigation applied at 120% ET_C recorded significantly higher plant height at 60 DAS and at harvest, number of branches per plant. However, irrigation scheduling did not affect significantly on plant populations at 20 DAS & at harvest, plant height at 30 DAS and days to 50% flowering. Land configuration of Broad Bed Furrow method resulted significantly higher plant height at 60 DAS and at harvest, number of branches per plant while land configuration did not significantly effect on plant population at 20 DAS and at harvest, plant height at 30 DAS and days to 50% flowering. Number of branches per plant was found significant effect with combined use of irrigation scheduling and land configuration.

Keywords: Growth parameter, drip irrigation scheduling, land configuration, broad bed furrow, groundnut

1. Introduction

Groundnut (*Arachis hypogaea* L.) is one of the most important oilseed crops cultivated worldwide owing to its high nutritional value and economic importance. The kernels contain approximately 50% oil and 25% protein, making groundnut a major source of edible oil and dietary protein. In India, groundnut occupies a prominent position among oilseed crops, with Gujarat being the leading producer. However, achieving higher productivity under semi-arid conditions requires efficient management of irrigation water and appropriate agronomic practices (Anon., 2026) [1]. Irrigation scheduling is a critical component of crop management as it ensures the timely application of water according to crop demand. Among various approaches, crop evapotranspiration (ET_C) based scheduling is considered the most reliable because it integrates climatic, soil and crop factors affecting water use (Allen *et al.*, 1998) [2]. Adequate moisture supply during flowering, pegging and pod development stages is essential for maximizing groundnut yield and water use efficiency. Drip irrigation has been reported to improve water use efficiency and reduce water losses compared to conventional irrigation methods (Keller and Bliesner, 1990 and Patel *et al.* 2010) [3, 4].

Land configuration also plays an important role in enhancing crop performance through improved soil aeration, moisture conservation, root growth and pod development. Techniques such as ridge and furrow and broad bed furrow (BBF) facilitate better water management and provide favourable soil conditions for groundnut growth (Sathiya *et al.* 2020) [5]. The combined use of efficient irrigation scheduling and suitable land configuration has the potential to improve productivity and resource-use efficiency under Gujarat conditions (Vaghasia *et al.* 2007 and Kamble *et al.* 2016) [6, 7]. Therefore, the present investigation was undertaken to evaluate the effect of drip irrigation scheduling and land configuration on the growth parameter of summer groundnut.

2. Materials and Methods

The field experiment was conducted in summer 2025 at Regional Research Station, Anand Agricultural University, Anand. The experiment was laid out in split plot design with three replications. The treatments comprised of four main plot treatments of irrigation scheduling viz.,

80% ET_C, 100% ET_C, 120% ET_C and flood irrigation and three sub plot treatments of land configuration viz., Flatbed, Broad Bed Furrow and Ridge & Furrow and replicated thrice. The gross plot size for all the plots was 4.0 x 5.0 m² and net plot size was 4.0 x 5.0 m² for Broad Bed Furrow 2.4 x 4.0 m² for flatbed and ridge & furrow method treatments. Recommended dose of fertilizer (25-50-00 kg/ha) was applied to all the treatments. The groundnut crop variety used for experiment was GG 34.

3. Results and Discussion

The results on drip irrigation scheduling and land configuration on growth of summer groundnut were depicted in Table 1.

3.1 Effect of drip irrigation scheduling

Plant population per meter row length at 20 DAS and at harvest was not significantly influenced by different drip irrigation scheduling treatments. Since irrigation treatments were imposed after crop establishment, germination and initial stand establishment remained unaffected. Similar findings were also reported by Vaghasiya *et al.* (2017)^[8], Bharade *et al.* (2019)^[9] and Solanke *et al.* (2021)^[10], who observed non-significant variation in plant population under different irrigation regimes in groundnut.

Plant height at 60 DAS and harvest was significantly influenced by irrigation scheduling, whereas the effect at 30 DAS was found non-significant. Irrigation scheduled at 120% ET_C recorded significantly greater plant height and remained statistically at par with 100% ET_C and 80% ET_C, while flood irrigation recorded the lowest values. The enhanced plant height under higher irrigation levels might be attributed to adequate moisture availability, which promoted nutrient uptake, cell elongation and photosynthetic activity. Similar results were reported by Arif *et al.* (2016)^[11], Ranjitha *et al.* (2018)^[12] and Hamd-Alla *et al.* (2023)^[13].

The number of branches per plant was significantly affected by irrigation scheduling. Irrigation at 120% ET_C produced the maximum number of branches per plant and remained at par with 100% ET_C, whereas flood irrigation recorded the lowest values. Adequate moisture supply under drip irrigation might have enhanced nutrient uptake and photosynthetic efficiency, resulting in increased vegetative growth. Similar findings have been reported by Kamble *et al.* (2018)^[14], Bharade *et al.* (2019)^[9] and Gautam *et al.* (2023)^[15].

Different irrigation scheduling treatments failed to exert a significant effect on days to 50% flowering. The non-significant

differences indicated that flowering behaviour of summer groundnut was relatively stable under varying moisture regimes. Similar observations were reported by Waseem *et al.* (2018)^[16] and Harisudan and Subramaniyam (2020)^[17].

3.2 Effect of land configuration

Land configuration also failed to exert a significant influence on plant population at both growth stages. The non-significant effect indicated that crop establishment was not appreciably affected by planting geometry under the prevailing conditions. Similar results were reported by Sinare *et al.* (2016)^[18] and Solanke *et al.* (2021)^[15].

Land configuration significantly affected plant height, with Broad Bed Furrow (BBF) recorded significantly higher values compared to flatbed and ridge and furrow methods. Improved drainage, better aeration and favourable root-zone conditions under BBF might have facilitated superior vegetative growth. These findings are in close agreement with those reported by Sinare *et al.* (2016)^[18], Solanke *et al.* (2021)^[10] and Sowmya *et al.* (2022)^[19].

Among land configuration treatments, Broad Bed Furrow recorded significantly higher number of branches per plant compared with flatbed and ridge and furrow methods. Better soil aeration and efficient utilization of moisture and nutrients under BBF might have promoted profuse branching. These findings corroborate the results of Solanke *et al.* (2021)^[10] and Sowmya *et al.* (2022)^[19].

Land configuration also did not significantly affected days to 50% flowering. Although numerical differences were observed among treatments, they were statistically non-significant. Similar findings were reported by Bharade *et al.* (2019)^[9] and Solanke *et al.* (2021)^[10].

3.3 Effect of interaction

The interaction effect between irrigation scheduling and land configuration (I × L) was found to be non-significant for plant population, plant height and days to 50% flowering, indicating that the response of these parameters to irrigation scheduling remained consistent across different land configurations. However, a significant interaction effect was observed for number of branches per plant presented in Table 2 indicated that the irrigation scheduling at 120 ET_C with the broad bed furrow land configuration observed significantly higher number of branches per plant and it remained at par with flatbed land configuration.

Table 1: Growth parameters as influenced by drip irrigation scheduling and land configuration

Treatments	Plant population per meter row length		Plant height (cm)			No. of branches per plant	Days to 50% flowering
	20 DAS	At harvest	30 DAS	60 DAS	At harvest		
Main plot: Irrigation Scheduling (I)							
I ₁ : 80% ET _C	10.29	10.18	13.79	27.67	57.56	13.11	35.00
I ₂ : 100% ET _C	10.71	10.60	14.16	27.78	58.22	13.33	36.11
I ₃ : 120% ET _C	10.16	10.04	14.70	29.11	60.22	14.78	37.00
I ₄ : Flood irrigation	10.02	9.91	13.58	24.44	53.22	12.22	35.22
S.Em. ±	0.37	0.36	0.43	0.90	1.34	0.45	0.61
CD at 5%	NS	NS	NS	3.12	4.63	1.57	NS
Sub plot: Land configuration (L)							
L ₁ : Flatbed	10.02	9.93	13.63	24.50	54.67	12.83	35.58
L ₂ : Broad Bed Furrow	10.63	10.55	14.67	29.83	59.92	14.17	36.08
L ₃ : Ridge and Furrow	10.23	10.07	13.88	27.42	57.33	13.08	35.83
S.Em. ±	0.30	0.26	0.30	0.57	0.76	0.22	0.43
CD at 5%	NS	NS	NS	1.69	2.28	0.66	NS
Interaction (I× L)							
S.Em. ±	0.60	0.53	0.61	1.13	1.52	0.44	0.86
CD at 5%	NS	NS	NS	NS	NS	1.32	NS

Table 2: Interaction effect of drip irrigation scheduling and land configuration on no. of branches

Irrigation scheduling	No. of branches		
	Land configuration		
	L1: Flatbed	L2: Broad Bed Furrow	L3: Ridge and Furrow
I ₁ : 80% ET _C	11.67	14.33	13.33
I ₂ : 100% ET _C	13.67	12.67	13.67
I ₃ : 120% ET _C	14.67	15.67	14.00
I ₄ : Flood irrigation	11.33	14.00	11.33
S.Em. ±	0.44		
CD at 5%	1.33		

4. Conclusion

Growth parameters of summer groundnut were significantly influenced by drip irrigation scheduling and land configuration. Higher irrigation levels (100–120% ET_C) and Broad Bed Furrow (BBF) improved plant height and branching through better moisture availability and root-zone conditions. Plant population and days to 50% flowering remained unaffected by different treatments. Overall, higher irrigation levels combined with BBF promoted superior vegetative growth of summer groundnut.

5. Acknowledgement

The author expresses sincere gratitude to Dr. A. S. Bhanvadia, Research Scientist, Regional Research Station, AAU, Anand and Principal and Dean, B. A. College of Agriculture, Anand Agricultural University, Anand – 388 110, Gujarat, India, for providing the necessary facilities and infrastructures for the successful conduct of the field experiment. The author also acknowledges with deep appreciation the unwavering support, encouragement, and cooperation extended by family members and friends throughout the course of the investigation.

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