



## Research Article

# STUDY OF VARIETY AND ROW SPACING ON GROWTH, YIELD AND ECONOMICS OF SUMMER COWPEA UNDER SOUTH GUJARAT CONDITION

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**Abstract:** The field experiment was conducted during 2021 to study the effect of variety and row spacing on Growth, Yield and Economics of summer cowpea [*Vigna unguiculata* (L.) Walp.] under south Gujarat condition. Significantly the highest growth attributes viz., plant height and number of branches plant<sup>-1</sup> was observed in variety GC-6 at 30, 45, 60 DAS and at harvest. Significantly the highest yield attributes, seed yield (1415 kg ha<sup>-1</sup>) and stover yield (2414 kg ha<sup>-1</sup>) were recorded with variety GC-6. The maximum gross return, net return and BCR were recorded under were recorded with variety GC-6. Significantly the highest plant height at 30, 45, 60 DAS and at harvest, respectively were recorded with 30 cm row spacing while, number of branches plant<sup>-1</sup> of 30, 45, 60 DAS and at harvest, respectively was recorded with 45 cm row spacing. Significantly the highest number of pods plant<sup>-1</sup>, number of seeds plant<sup>-1</sup>, length of pod, seed yield (1421.89 kg ha<sup>-1</sup>) and stover yield (2405.94 kg ha<sup>-1</sup>) were recorded with 45 cm row spacing. The maximum gross return, net return and BCR were recorded under were recorded with 45 cm row spacing.

**Keywords:** Cowpea, Variety, Row spacing, Growth, Yield parameter and economics

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## Introduction

India is the largest producer as well as consumer of pulses (also referred to as grain legumes, peas and beans) in the world. In India, pulses are grown nearly on 28.34 M ha with an annual production of 23.15 MT and average productivity of 817 kg ha<sup>-1</sup> [1]. Cowpea is a member of the Leguminosae family. Due to its tolerance for sandy soil and low rainfall, it is an important crop in the semiarid regions and marginal area of the tropics and subtropics. In Gujarat, cowpea is cultivated in 0.52 M ha with an annual production of 0.35 MT and average productivity of 665 kg ha<sup>-1</sup>. The spacing of planting is one of the most important factors, which in the first place influences the yields, the quality, and quite often the earliness of the respective cultivar.

Consequently, the number of plants unit<sup>-1</sup> has an indirect effect on the production costs and profitability in general. Improved variety must show characters like disease and insect resistance, high yield, early maturity, plant height, should be economical to the farmers and should have superior quality and nutrient level. Seeds of improved varieties are important in raising yields and ensuring food security, proper nutrition and prosperity for not only smallholder farmers but the general population. Looking into importance of varieties and row spacing, a field experiment was conducted on effect of variety and row spacing growth, yield and economics of summer cowpea.

## Material and Methods

A field experiment was conducted during summer season of year 2021 at the Soil and Water Management, NARP Phase-II (NARP Farm), Cotton Research Sub Station, N.A.U., Achhalia (South Gujarat Agro Climatic Zone - II). The soil of the experimental field was clayey in texture having medium to poor drainage, soil pH 7.23, EC 0.265 dS m<sup>-1</sup> and organic carbon content 0.44 per cent with medium in available nitrogen (282.2 kg ha<sup>-1</sup>), medium in available phosphorus (36.01 kg ha<sup>-1</sup>) and high in available potassium (318.9 kg ha<sup>-1</sup>) and slightly alkaline in reaction.

The experiment was laid out in RBD (factorial concept) design with 12 treatment combinations consisting of two factors i.e., varieties (V<sub>1</sub>- GC-4, V<sub>2</sub>- GC-5 and V<sub>3</sub>- GC-6), row spacing (S<sub>1</sub>- 30 cm, S<sub>2</sub>- 45 cm and S<sub>3</sub>- 60 cm). The entire dose of fertilizer was 20-40-00 N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O kg ha<sup>-1</sup>.

The five plants from each plot were randomly selected and tagged for measuring the plant height (cm)<sup>-1</sup> at 30, 45, 60 DAS and harvest. The five plants from each plot were randomly selected and tagged for measuring the number of branches plant<sup>-1</sup> at 30, 45, 60 DAS and harvest. At harvesting, 5 plants from each plot were selected for recording yield components. Total number of pods plant<sup>-1</sup> (from 5 plants) were recorded and averaged to get the number of seeds plant<sup>-1</sup>, Length of pod (from 5 plants) and 100 seed weight were recorded using a measuring tape, weighed using an electronic weighing machine. Other yield components i.e. seed and stover yield kg ha<sup>-1</sup>. The data were analyzed statistically by adopting the standard procedures described by Panse and Sukhatme (1973) [2]. The purpose of the analysis of variance was to determine the significant effect of treatments on cowpea.

## Results and Discussion

### Effect of variety

#### Growth parameters

The result pertaining to growth parameters [Table-1] showed that variety GC-6 recorded significantly higher plant height (24.43, 34.97, 50.99 and 59.89 cm) at 30, 45 and 60 DAS and at harvest as compared to other varieties. It has been justified with reason that the varieties with different plant height is generally depends on genetical makeup of a particular variety. On the contrary to this, Umesha and Purushotham (1996) [3] in cowpea observe differences in plant height of different varieties.

Table-1 Effect of variety and row spacing on growth and yield parameter on summer cowpea

Treatment	Plant height (cm)			Number of branches plant <sup>-1</sup>					Number of pods plant <sup>-1</sup>	Number of seeds plant <sup>-1</sup>	Length of pod	100 Seed weight (g)
	At 30 DAS	At 45 DAS	At 60 DAS	At harvest	At 30 DAS	At 45 DAS	At 60 DAS	At harvest				
Variety (V)												
V <sub>1</sub> : GC-4	23.84	34.71	49.38	56.32	3.89	4.69	5.84	6.41	17.20	10.09	12.23	11.33
V <sub>2</sub> : GC-5	22.36	31.71	45.26	53.75	3.79	4.57	5.70	5.99	17.09	10.10	12.07	10.40
V <sub>3</sub> : GC-6	24.43	34.97	50.99	59.89	4.333	5.90	6.22	6.54	21.87	11.09	13.38	10.65
S.E.m. $\pm$	0.43	0.76	1.35	1.58	0.07	0.13	0.13	0.15	0.51	0.30	0.33	0.29
CD (p=0.05)	1.25	2.23	3.93	4.62	0.21	0.38	0.38	0.45	1.49	0.87	0.95	NS
Row Spacing (S)												
S <sub>1</sub> : 30 cm	24.80	35.65	51.29	59.98	3.91	4.96	5.80	6.06	18.31	10.22	12.43	11.02
S <sub>2</sub> : 45 cm	23.31	33.92	50.18	55.53	4.41	5.37	6.35	6.96	19.84	11.04	13.43	11.18
S <sub>3</sub> : 60 cm	22.52	31.82	44.15	54.44	3.68	4.83	5.61	5.92	18.01	10.03	11.82	10.18
S.E.m. $\pm$	0.43	0.76	1.35	1.58	0.07	0.13	0.13	0.15	0.51	0.28	0.33	0.29
CD (p=0.05)	1.25	2.23	3.93	4.62	0.21	0.38	0.38	0.45	1.49	0.80	0.95	NS
Interaction												
S.E.m. $\pm$	0.74	1.32	2.33	2.74	0.12	0.23	0.22	0.26	0.88	0.48	0.56	0.51
C.D. at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV %	6.28	7.82	9.60	9.68	6.17	8.95	7.59	8.38	9.42	9.15	8.98	9.38

Table-2 Effect of variety and row spacing on yield attribute and economics on summer cowpea

Treatment	Seed yield (kg ha <sup>-1</sup> )	Seed yield (kg ha <sup>-1</sup> )	Harvest index (%)	Gross realization (₹ ha <sup>-1</sup> )	Cost of production (₹ ha <sup>-1</sup> )	Net realization (₹ ha <sup>-1</sup> )	BCR
Variety (V)							
V <sub>1</sub> : GC-4	1266	2166	36.99	79577	31161	48416	1.55
V <sub>2</sub> : GC-5	1310	2231	37.07	82256	31161	51095	1.64
V <sub>3</sub> : GC-6	1415	2414	36.94	88878	31161	57717	1.85
S.E.d	41.41	62.41	0.90	-	-	-	-
CD (p=0.05)	120.85	182.13	NS	-	-	-	-
Row Spacing (S)							
S <sub>1</sub> : 30 cm	1297	2219	36.85	81501	31711	49790	1.57
S <sub>2</sub> : 45 cm	1421	2405	37.35	89139	31711	57978	1.86
S <sub>3</sub> : 60 cm	1273	2187	36.80	80071	31711	49460	1.62
S.E.m. $\pm$	41.41	62.41	0.90	-	-	-	-
CD (p=0.05)	120.85	182.13	NS	-	-	-	-
Interaction							
S.E.m. $\pm$	71.72	108.10	1.56	-	-	-	-
C.D. at 5 %	NS	NS	NS	-	-	-	-
CV %	10.28	9.52	8.45	-	-	-	-

The result pertaining to growth parameters [Table-1] showed that variety GC-6 recorded significantly higher number of branches plant<sup>-1</sup> (4.33, 5.90, 6.22 and 6.54) at 30, 45 and 60 DAS and at harvest as compared to other varieties. This might be due to favourable conditions during crop growth stage, which resulted in better physiological activities of cell division and stem elongation that leads to increase in the branches per plant. These results were also reported by Jaybhay *et al.* (2014) [4], Ramgiry *et al.* (2014) [5] and Bhilore *et al.* (2016) [6] in soybean.

#### Yield attributes and yield

The result pertaining to yield attributes [Table-1] showed that significantly the highest number of pods plant<sup>-1</sup> (21.87), number of seeds plant<sup>-1</sup> (11.09), length of pod (13.38) was observed in variety GC-6 (V<sub>3</sub>) over other varieties and 100 seed weight (11.33 gm) was observed in GC-4 variety. This was due to better performance of GC-6 in term of growth parameter resulted into higher number of pods plant<sup>-1</sup>, number of seeds plant<sup>-1</sup> and length of pod as compared to GC-4 and GC-5 varieties.

These results agree with finding of Bobade *et al.* (2018) [7] in greengram, Kumar *et al.* (2018) [8] in blackgram and Jnanasha *et al.* (2019) [9] in mungbean. Significantly higher seed yield (1415.36 kg ha<sup>-1</sup>) was recorded in GC-6 variety (V<sub>3</sub>), which was at par with GC-5 variety (V<sub>2</sub>) and significantly the highest stover yield (2414.68 kg ha<sup>-1</sup>) was recorded in variety GC-6 (V<sub>3</sub>) over other varieties and harvest index (37.07 %) was observed in GC-5 variety. This was due to better performance of GC-6 in term of yield attributes resulted into higher seed and stover yield as compared to GC-4 and GC-5. These results agree with finding of Bobade *et al.* (2018) in greengram, Kumar *et al.* (2018) blackgram and Jnanasha *et al.* (2019) in mungbean.

#### Economics

It is obvious from the data reported in [Table-2] that the maximum net realization (₹57717 ha<sup>-1</sup>) and BCR (1.85) was obtained from variety GC-6 as compared to other varieties. This is due to the higher yields produced by variety GC-6 of cowpea. The results are close conformity to these obtained by Bobade *et al.* (2018) in greengram, Kumar *et al.* (2018) blackgram and Jnanasha *et al.* (2019) in mungbean.

#### Effect of row spacing

##### Growth parameters

The result pertaining to growth parameters [Table-1] showed that significantly higher plant height of (24.80, 35.65, 51.29 and 59.98 cm) 30, 45 and 60 DAS and at harvest, respectively were observed under 30 cm row spacing (S<sub>1</sub>) which was at par with 45 cm row spacing (S<sub>2</sub>) at 45, 60 DAS and at harvest except 30 DAS. Increase in plant height at 30 cm spacing might be due to fact that plant gets enough space for growth and proper light interception resulted in increased plant height. These findings are substantiated with those reported by Dhanga *et al.* (2010) [10] in greengram.

The result pertaining to growth parameters [Table-1] showed that significantly the highest number of branches plant<sup>-1</sup> of (4.41, 5.37, 6.35 and 6.96) at 30, 45 and 60 DAS and at harvest, respectively were observed under 45 cm row spacing (S<sub>2</sub>) over other varieties. This might be due to plants grown with wider spacing got better opportunity of available maximum space, light and nutrients leading to maximum branches plant<sup>-1</sup>. The above findings are in complete agreement with earlier work of Sathe and Patil (2012) in pigeonpea [11], Mohapatra (1998) [12] and Khanda *et al.* (2001) in rice bean and Thakur *et al.* (1998) [13] in soybean.

##### Yield attributes and yield

The result pertaining to yield parameter [Table-1] showed that significantly the highest number of pods plant<sup>-1</sup> (19.84), number of seeds plant<sup>-1</sup> (11.04) and length of pod (13.43) and 100 seed weight (11.18 gm) was recorded in 45 cm row spacing over other row spacing. These findings are substantiated with those reported by Rajput and Kaushik (1992) [14] in soybean and Laxminarayana (2003) [15] in red gram with respect to number of pods plant<sup>-1</sup>, number of seeds plant<sup>-1</sup> and length of pod. Significantly the highest seed yield (1421. kg ha<sup>-1</sup>), stover yield (2405.94 kg ha<sup>-1</sup>) and harvest index (37.35 %) was recorded in 45 cm row spacing (S<sub>2</sub>) over other row spacing. The highest seed and stover yield under 45 cm row spacing might be due to advantage of better utilization of moisture and nutrient as well as solar radiation due better orientation of the leaves which in turn resulted in greater amount of photosynthesis leading to increase in yield attributes there by resulted in higher seed yield. Similar results were confirmed by Mondal *et al.* (2014) [16] in soybean.

## Economics

It is obvious from the data reported in [Table-2] that the maximum net realization (₹57978 ha<sup>-1</sup>) and BCR (1.86) were obtained from 45 cm row spacing as compared to over other row spacing. This is due to the higher yields of green gram produced in the 30 cm narrow row spacing. The results are close conformity to these obtained by Mondal *et al.* (2014) in soybean.

## Conclusion

Based on results of the one year experiment and its result it can be concluded that profitable yield of summer cowpea can be obtained by sowing GC-6 variety with 45 cm row spacing under south Gujarat condition.

**Application of research:** Study of variety and row spacing on growth, yield and economics of summer cowpea

**Research Category:** Agriculture Economics

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**Study area / Sample Collection:** NARP Farm, Cotton Research Sub Station, Achhalia

**Cultivar / Variety / Breed name:** cowpea [*Vigna unguiculata* (L.) Walp.]

**Conflict of Interest:** None declared

**Ethical approval:** This article does not contain any studies with human participants or animals performed by any of the authors.  
Ethical Committee Approval Number: Nil

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