

## Response of Pea Varieties to Irrigation Regimes During Rabi Season

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**ABSTRACT:** A field experiment was conducted at Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri to study the response of different varieties of pea to irrigation regimes during rabi season during rabi season, 2013. The growth attributing parameters viz., plant height, number of branches, dry matter and the weight of pods per plant and pod yield was significantly maximum when irrigation was applied at 25 mm CPE level (93.30 q ha<sup>-1</sup>). Among the different varieties of pea, the Phule Priya variety obtained significantly highest pod yield (88.19 q ha<sup>-1</sup>) followed by GS-10 (82.80 q ha<sup>-1</sup>). The gross and net monetary returns were obtained maximum in treatment when irrigation at 25 mm CPE level while among the varieties, Phule Priya variety of pea obtained maximum gross and net monetary returns. It could be concluded that, irrigation at 25 mm CPE level to Phule Priya variety of pea during rabi season found suitable to achieve maximum growth, yield and monetary returns.

**Keywords:** Pea, Varieties, irrigation regimes.

### INTRODUCTION

Pea (*Pisum Sativum* L.) is one of the most common and important nutritious vegetable grown throughout the world. Pea is a grain legume belongs to the fabaceae family. Pea is an excellent human food, either eaten as vegetable or used in soup preparation. Large proportions of peas are processed for consumption in off season. The pea is rich in nutrition because its grain is affluent in protein (27.8%), tortuous carbohydrates (42.65%), vitamins, minerals, dietary fibers and antioxidant compounds. In India, maximum cultivation of pea is in Uttar Pradesh covering about 60% area followed by Bihar and Madhya Pradesh (Singh and Joshi, 1970). In Maharashtra it is grown on an area of 7000 ha with 32,200 metric tons production (Anonymous, 2011). The short winter season (November-January) limits the productivity and the wide differences in day and night temperature during the growing season, also deteriorate the quality of produce.

Early bulking varieties with high yield, responding high day temperature and maintaining good quality, would play an important role in increasing adaptability of this crop in Maharashtra. Irrigation management is of special importance as

the proper irrigation may bring 100-150 per cent increase in the yield depending upon the soil type, time of irrigation. Green pea is sensitive to moisture stress at flowering. Systematic study on different levels of irrigation regimes are still lacking in respect of higher yield which can respond to short growing season.

### MATERIAL AND METHODS

Research was carried out at Post Graduate Institute Research Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri Research field is situated on 19°24' N latitude and 76°19' E longitude. The altitude varies from 495 to 555 m above the mean sea level. Climatologically, the area falls under semi-arid and sub tropical zone. The experiment consists of twelve treatment combinations. The main plot treatments consist of four irrigation regimes and subplot treatments consist of three varieties.

The experiment was laid out in split plot design with three replications comprised of four irrigation regimes viz., I<sub>1</sub>-Irrigation at 25 mm CPE, I<sub>2</sub>-Irrigation at 50 mm CPE, I<sub>3</sub>-Irrigation at 75 mm CPE and I<sub>4</sub>-Irrigation as per critical stages (Branching, Flowering, Pod formation) and three varieties viz., V<sub>1</sub>-Arkel, V<sub>2</sub>-Phule-Priya and V<sub>3</sub>-GS-10. These treatments were

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**Table 1**  
**Growth and yield contributing characters as influenced by different treatments in peas**

Treatment	Plant height (cm)			Number of branches plant <sup>-1</sup>			Yield contributing characters						
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	No. of pods <sup>-1</sup> plant	No. of grain <sup>-1</sup> pod	Length of pod (cm)	Wt of pods <sup>-1</sup> plant (g)	Wt of bhusa <sup>-1</sup> plant (g)	Wt. of grains <sup>-1</sup> plant (g)	Test weight (g)
<i>Irrigation Regimes</i>													
Irrigation at 25 mm CPE	22.83	44.38	48.0	1.21	2.74	2.8	16.42	7.3	7.37	44.56	14.05	27.3	20.11
Irrigation at 50 mm CPE	21.8	39.87	42.07	1.12	2.52	2.72	15.84	7.3	7.36	38.45	13.05	26.11	20.0
Irrigation at 75 mm CPE	21.65	38.47	40.44	1.11	2.41	2.6	15.16	7.1	7.22	6.64	12.8	24.88	19.92
Irrigation as per critical growth stages	22.24	40.03	42.21	1.13	2.61	2.8	16.07	7.3	7.3	41.18	13.3	26.98	20.14
S. Em. ±	0.15	0.18	0.09	0.02	0.04	0.05	0.08	0.04	0.05	0.10	0.08	0.27	0.10
CD at 5%	0.52	0.65	0.32	0.60	0.15	0.18	0.29	0.12	0.16	0.36	0.29	0.94	0.34
<i>Varieties</i>													
Arkel	19.46	38.9	41.24	1.07	2.48	2.55	15.7	6.6	6.78	38.73	13.28	25.24	19.8
PhulePriya	26.57	44.49	46.29	1.27	2.66	3.03	16.29	7.61	7.54	42.06	13.31	27.98	20.5
GS-10	20.36	38.69	42.01	1.11	2.58	2.6	15.64	7.6	7.51	39.84	13.14	25.81	19.83
S. Em. ±	0.14	0.25	0.31	0.02	0.03	0.04	0.11	0.04	0.04	0.12	0.07	0.16	0.12
CD at 5%	0.43	0.75	0.94	NS	NS	0.11	0.35	0.12	0.14	0.38	0.24	0.48	0.36
<i>Interaction</i>													
<i>'V' at same level of 'I'</i>													
S.Em. +	0.29	0.50	0.62	0.05	0.06	0.08	0.23	0.08	0.09	0.27	0.15	0.32	0.24
CD at 5%	0.86	1.50	1.88	0.18	0.23	0.27	0.65	0.27	0.31	0.76	0.47	0.88	0.69
<i>'I' at same level of 'V'</i>													
S. Em. ±	0.28	0.45	0.54	0.06	0.08	0.09	0.21	0.08	0.06	0.24	0.13	0.38	0.22
CD at 5%	0.83	1.38	1.52	0.20	0.28	0.34	0.63	0.26	0.23	0.74	0.43	0.96	0.67
<i>General Mean</i>	22.13	40.69	43.18	1.15	2.57	2.73	15.87	7.25	7.29	40.21	13.30	26.34	20.04

replicated thrice times in a split plot design. The soil of experimental field was well drained. The soil depth varies from 30-45 cm. The soil physical properties such as field capacity, permanent wilting point and bulk density were 36.84 per cent, 18.17 per cent and 1.29 g cm<sup>-3</sup>, respectively. The soil was low in available nitrogen (170.49 kg ha<sup>-1</sup>), moderate in available phosphorus (14.20 kg ha<sup>-1</sup>) and very high in available potassium (392.20 kg ha<sup>-1</sup>) with moderately alkaline in reaction (pH 7.80). The electrical conductivity of soil was 0.23 dSm<sup>-1</sup> at 25°C and initial organic carbon content was 0.49 per cent.

## RESULTS AND DISCUSSION

### Plant height

The data regarding mean plant height plant as influenced periodically by irrigation regimes and varieties are presented in Table 1.

The mean plant height was significantly influenced periodically due to irrigation regimes from 30 DAS upto harvest of crop. Among the irrigation regimes treatments, irrigation given at 25 mm CPE level recorded significantly maximum plant height of 22.83 cm, 44.38 cm and 48.0 cm at 30, 60 DAS and at harvest, respectively as compared to

the rest of treatments. Significantly maximum plant height was recorded by the variety Phule-Priya than the rest of varieties under study at all the periodical observations. The maximum plant height was registered by variety Phule Priya variety was 26.57 cm, 44.49 cm, and 46.29 cm at 30, 60 DAS and at harvest respectively.

### Number of Branches Per Plant

The data regarding mean number of branches per plant as influenced periodically by irrigation regimes and varieties are presented in Table 1. The mean number of branches per plant was significantly influenced due to irrigation regimes treatment.

The significantly higher number of branches per plant registered was, 1.21, 2.74 and 2.80 at 30, 60 DAS and at harvest respectively, when irrigation was applied at 25 mm CPE level. These results are inconformity with Rathi *et al.* (1995). This implied that irrigation at branching and flowering stage was the most crucial. The mean number of branches per plant was recorded more 1.27, 2.66 and 3.03 at 30 DAS, 60 DAS and at harvest respectively, in Phule Priya variety of pea.

**Table 2**  
Days to first flower initiation, Days to 50% flowering, Green pod yield and economics as influenced by different treatments in peas.

Treatment	Days to first flower initiation	Days to 50% flowering	Green pod yield ( $qha^{-1}$ )	Gross monetary returns ( $Rs\ ha^{-1}$ )	Cost of cultivation ( $Rs\ ha^{-1}$ )	Net monetary returns ( $Rs\ ha^{-1}$ )	B:C ratio
<i>Irrigation Regimes</i>							
Irrigation at 25 mm CPE level	42.47	46.73	93.30	188072	37195	150877	4.05
Irrigation at 50 mm CPE level	40.47	45.87	80.22	161243	35495	125748	3.52
Irrigation at 75 mm CPE level	39.93	45.37	76.48	154331	35195	118136	3.35
Irrigation as per critical growth stages	39.58	43.23	86.12	173589	34995	138593	3.96
S. Em. $\pm$	0.15	0.23	0.30	-	-	-	-
CD at 5%	0.52	0.80	0.91	-	-	-	-
<i>Varieties</i>							
Arkel	31.13	35.28	81.10	163604	32287	130567	4.04
PhulePriya	46.01	50.50	88.19	177797	34187	143610	4.20
GS-10	44.71	50.12	82.80	166525	40687	125838	3.09
S. Em. $\pm$	0.12	0.13	0.25	169323	35720	133338	3.74
CD at 5%	0.38	0.39	0.77	-	-	-	-
<i>Interaction</i>							
<i>'V' at same level of 'I'</i>							
S. Em. $\pm$	0.25	0.26	0.51	-	-	-	-
CD at 5%	0.76	0.78	1.55	-	-	-	-
<i>'I' at same level of 'V'</i>							
S. Em. $\pm$	0.27	0.20	0.67	-	-	-	-
CD at 5%	0.83	0.66	1.78	-	-	-	-
<i>Geeral Mean</i>	40.61	45.30	84.03				

### Days Required to Initiation of First Flower

The data regarding number of days required to initiation of first flower of different irrigation regimes and varieties are presented in Table 2. The early flowering was observed in the treatment when irrigation was applied as per the critical growth stages *i.e.* first irrigation at branching, second irrigation at flowering and third irrigation at pod development stage (39.58 days) while late flowering was observed in treatment when irrigation was applied at 25 mm CPE irrigation level (42.47 days). The mean number days for initiation of first flower were significantly influenced periodically due to different varieties of pea. The early flowering was registered by the variety Arkel (31.13) than the Phule Priya (46.01) and GS-10 variety (44.71). The type of trend was observed due to genetically character of varieties.

### Days to 50 Per cent Flowering

The data regarding number of days required to 50 per cent flower of different irrigation regimes and varieties are presented in Table 2.

The 50 percent flowering had significant effect by different irrigation regimes. The 50 percent flowering was observed in irrigation as per critical growth stages *i.e.* first irrigation at branching, second irrigation at flowering and third irrigation at pod

development stage (43.23 days) while the late 50% flowering was observed in irrigation at 25 mm CPE irrigation level (46.73 days). This might be due to no stress in 25 mm CPE irrigation level. The maximum 50 per cent flowering was observed in the variety Arkel (35.28 days) than the Phule-Priya (50.50 days) variety of pea and GS-10 variety (50.12 days).

### Post Harvest Studies

#### *Yield contributing characters*

The data in relation to yield contributing characters *viz.*, number of pods plant<sup>-1</sup>, number of grains pod<sup>-1</sup>, weight of pods plant<sup>-1</sup>, weight of bhusa plant<sup>-1</sup>, length of pod (cm) are presented in Table 1.

#### *Number of pods*

The irrigation applied at 25 mm CPE level gives maximum number of pods per plant (16.42) Similar results of increase in number of pods per plant were reported by Singh *et al.* (2001). The maximum numbers of pods per plant were recorded in Phule-Priya variety (16.29).

#### *Number of grains per pod*

The irrigation at 25 mm CPE, 50 mm CPE and as per critical growth stages showed maximum number of

grains (7.3) Similar results were recorded by Dubey *et. al.*, (1999). Significantly maximum number of grains was recorded in Phule Priya variety (7.61) while lowest mean number of grains per pod was recorded in Arkel variety (6.6).

#### **Length of pod (cm)**

The irrigation at 25 mm CPE showed significantly maximum length of pod (7.37cm) than rest of the treatments. The mean length of pod per plant was significantly influenced by various varieties. The significantly maximum length of pod was recorded in Phule-Priya variety (7.54).

#### **Weight of pods per plant**

The irrigation applied at 25 mm CPE level showed significantly maximum weight of pods per plant (44.56 g). Significantly maximum weight of pods per plant was recorded in Phule-Priya variety (42.06 g).

#### **Weight of seeds per plant**

The irrigation applied at 25 mm CPE level recorded maximum weight of grains per plant (27.30 g). Maximum mean weight of grains per plant was recorded in Phule Priya variety (13.31 g).

#### **Test weight per plant**

The more test weight was observed in treatment when irrigation was applied at 25 mm CPE level (20.11 g). Among the different varieties, the maximum test weight was recorded in PhulePriya variety (20.5 g).

#### **Pod yield per hectare**

Significantly maximum pod yield was obtained in the treatment when irrigation was applied at 25 mm CPE level (93.30 q ha<sup>-1</sup>). The maximum pod yield was recorded in PhulePriya variety (88.19 q ha<sup>-1</sup>) and lowest pod yield was recorded in Arkel variety (81.10 q ha<sup>-1</sup>).

### **ECONOMIC STUDIES**

The data regarding economic evaluation of pea in terms of cost of production, gross monetary returns, net monetary returns and benefit cost ratio are given in Table 2.

The maximum gross monetary returns were obtained from treatment when irrigation was applied at 25 mm CPE irrigation level (Rs. 188072 ha<sup>-1</sup>) as compared to other treatments. Among the different variety of pea, the gross monetary returns per ha was maximum (Rs. 177797 ha<sup>-1</sup>) in PhulePriya variety as compared to other variety.

The maximum net monetary returns were obtained from treatment when irrigation was applied at 25 mm CPE level (Rs. 150877 ha<sup>-1</sup>). The maximum net monetary returns were obtained in PhulePriya variety (Rs. 143610 ha<sup>-1</sup>) as compared to other variety.

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