

Effect of Different Varieties and Planting Time on Kharif Onion Production in Lower Shivalik Hills of Himachal Pradesh

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ABSTRACT

An experiment was conducted to assess the effect of varieties and planting time on *kharif* onion production under low hill conditions of Himachal Pradesh at Research Farm of the Institute of Biotechnology and Environmental Science (Dr. Y.S. Parmar, University of Horticulture and Forestry), Neri, Hamirpur for two consecutive seasons (2011 & 2012). The farm is located at an altitude of 620 m above mean sea level with average mean maximum and minimum temperature levels of 31.3°C and 12.4°C, respectively and is a representative site of low hill region of Himachal Pradesh. Four cultivars of onion viz. N-53, Nasik Red, Agrifound Dark Red (AFDR) and Agrifound Light Red (AFLR) were transplanted on six dates at ten days interval starting from 5th July to 25th August. The experiment was laid out in factorial randomized block design with three replications for each treatment. Healthy seedlings were transplanted on raised beds at a spacing of 15 x 10 cm in plots of 3.0 x 3.0 m². Recommended cultural practices were followed during investigation to raise the crop successfully. All the observations pertaining to traits viz. plant height (cm), neck thickness (cm), bulb diameter (cm), bulb weight (g), days for harvesting, and yield (q/ha) were taken by randomly selecting twenty healthy plants from each plot. Standard package and practices were followed for raising the crop as per the recommendations of the University. The maximum bulb diameter (5.50 cm) was (ng to bulb diameter showed that all the variables had significant effect on bulb diameter. the ing 2011) and highest bulb weight (64.37 g) among cultivars was noticed in cultivar Agrifound Dark Red. There was a significant effect of both by varieties and transplanting dates. The highest average yield (229.03 q/ha) was observed in cultivar AFDR. The highest bulb yield (197.54 q/ha) among transplanting dates was noted on third transplanting date D₃ (25th July). Therefore it can be summarized that cultivar Agrifound Dark Red is the best suited cultivar for *kharif* onion production in lower Shivalik hills of Himachal Pradesh and it should be transplanted around 25th July for maximization of bulb yield.

Keywords: Kharif onion, Varieties, Transplanting dates, Yield, Bulb

INTRODUCTION

Onion is the most important crop among various alliums grown in India for thousands of years now. It occupies an area of 10,52,000 ha with a total production of 1,68,13,000MT and an average productivity of 16.0 MT/ha (9). There has been a steady increase in area and production of onions in the last decade. The beneficial compound called quercetin present in onion has shown to be

a powerful antioxidant. A phyto-chemical allium and allyl disulphide are found in onion which converts into allicin when its modified leaves are crushed. Studies have shown that that these compounds have anti-mutagenic properties. Allicin reduces cholesterol production by inhibiting HMG-CoA reductase enzyme in the liver cells. (6).

Besides the traditional Rabi crop (winter season), the Kharif crop (rainy season) is now being

grown successfully in the north and eastern parts of the country which has revolutionized the onion production and marketing in the country. The *rabi* crop harvested in April-May is stored all over the country and slowly made available for domestic supply as well as export up to September-October. There is critical gap in supply of onion in the country from October to March and as a result the prices shoot up. A good harvest in *kharif* season can bridge the gap between demand and supply of onion during this dearth period. Further, production of onion during *kharif* season offers a good alternative to the farmers for obtaining higher returns. (12)

Low and mid hill areas of Himachal Pradesh are perfectly suitable for onion cultivation. Number of farmers has taken up this venture on commercial scale but focus is on the main season crop which does not fetch good price in the market. Onion is photo-thermo sensitive crop and thus time of planting varies from region to region. In Maharashtra best time of planting for *kharif* onion is July to August and in northern plains it is mid or end of August whereas in West Bengal and Orissa transplanting is done as late as August to September (11). Though some work has been done by various agencies on standardization of production technology of *kharif* onion but only few reports are available for the state. Moreover, the *kharif* onion production has never been taken up as an enterprise by the farmers of the district. Therefore present studies were conducted to find out the effect of varieties and their transplanting time to make onion production during *kharif* season a success in low hills of the state.

MATERIALS AND METHODS

An experiment was conducted during *kharif*



Fig. 1: Onion cultivar AFDR in the field

season of 2011 and 2012 to study effect of different varieties and planting time on *kharif* onion production in lower Shivalik hills of Himachal Pradesh. The experimental site is located at an altitude of 620 m above mean sea level with latitude 31° 682' N and longitude 76° 522' E. The mean minimum and maximum temperature ranges between 12.4° C to 31.3° C and average humidity remains around 60.91%. The soil in the experimental area was clay loam with a pH of 6.6 and had 0.38 % organic matter content. Four cultivars of onion viz. N-53, Nasik Red, Agrifound Dark Red (AFDR) and Agrifound Light Red (AFLR) were transplanted on six dates at ten days interval starting from 5th July to 25th August.

The experiment was laid out in factorial randomized block design with three replications for each treatment. Eight weeks old healthy seedlings were transplanted on raised beds at a spacing of 15 x 10 cm in plots of 3.0 x 3.0 m². Recommended cultural practices were followed during investigation to raise the crop successfully. All the observations pertaining to traits viz. plant height (cm), neck thickness (cm), bulb diameter (cm), weight of bulb(g), days for harvesting and yield were taken by randomly selecting twenty healthy seedlings from each plot. The bulb yield was noted on plot basis. The data obtained during two years was pooled according to the standard procedure given by Gomez and Gomez (5).

RESULTS AND DISCUSSION

The results pertaining to growth and yield of *kharif* onion as affected by varieties and transplanting dates are presented in table 1 to 6. There was a significant difference in the plant height among the varieties during both the years under study. The



Fig. 2: Onion cultivar AFDR after harvest

maximum plant height (54.55 cm) was observed in cultivar Nasik Red followed by AFDR (54.15 cm). The plant height in these two cultivars was statistically at par with each other and significantly higher than N-53 (43.69 cm). A continuous decrease in plant height was observed with delay in transplanting. Highest plant height (55.06 cm) was observed on D₁ (5th July),

whereas the minimum plant height (47.64 cm) was recorded on date D₄ (25th August). This might be attributed to longer growth period of early planted crop before the initiation of bulb development. Dev *et al.* (3) also reported a significant effect of transplanting dates on plant height in kharif onion. The effect of variety x date interaction for plant height

Table 1 : Effect of varieties and date of transplanting on plant height (cm) in onion (Pooled data for two years)

Varieties	Transplanting dates						Mean
	D1 (5th July)	D2 (15th July)	D3 (25th July)	D4 (5th August)	D5 (15th August)	D6 (25th August)	
V1 (N-53)	49.25	44.21	45.24	42.11	41.19	40.15	43.69
V2 (Nasik Red)	60.15	55.23	56.12	51.23	52.21	52.33	54.55
V3 (AFDR)	57.6	55.22	54.11	54.1	52.81	51.09	54.15
V4 (AFLR)	53.23	52.15	50.88	48.11	48.15	47.01	49.92
Mean	55.06	51.7	51.58	48.89	48.89	47.64	
CD(0.05%)	Variety		6.23				
	Date		7.11				
	Variety x Date		NS				

Table 2 : Effect of varieties and date of transplanting on neck diameter (cm) in onion(Pooled data for two years)

Varieties	Transplanting dates						Mean
	D1 (5th July)	D2 (15th July)	D3 (25th July)	D4 (5th August)	D5 (15th August)	D6 (25th August)	
V1 (N-53)	1.01	1.07	1.09	1.02	0.98	0.96	1.02
V2 (Nasik Red)	0.88	1.05	1.07	1.03	1.01	0.96	1
V3 (AFDR)	0.84	0.99	1.04	1	0.95	0.92	0.95
V4 (AFLR)	0.78	0.84	0.91	0.87	0.83	0.8	0.83
Mean	0.88	0.99	1.02	0.98	0.94	0.91	
CD(0.05%)	Variety		NS				
	Date		0.08				
	Variety x Date		NS				

was non-significant. Similar results were obtained by Gautam *et al.* (4) who also reported non-significant effect of transplanting dates and variety x dates interaction on plant height under Nepal conditions.

The storage life of onion bulb can be pre-judged by studying the neck diameter. The onion with thin neck diameter store better than those having thick diameter. Neck thickness of sampled plants was

Table 3: Effect of varieties and date of transplanting on days to harvest (days) in onion(Pooled data for two years)

Varieties	Transplanting dates						Mean
	D1 (5th July)	D2 (15th July)	D3 (25th July)	D4 (5th August)	D5 (15th August)	D6 (25th August)	
V1 (N-53)	144	139	132	128	124	122	131.5
V2 (Nasik Red)	149	146	139	133	130	128	137.5
V3 (AFDR)	138	135	130	126	122	120	128.5
V4 (AFLR)	137	135	131	127	119	117	127.6
Mean	142	138.8	133	128.5	123.8	121.8	
CD(0.05%)	Variety		5.23				
	Date		15.5				
	Variety x Date		21.12				

Table 4 : Effect of varieties and date of transplanting on bulb diameter (cm) in onion(Pooled data for two years)

Varieties	Transplanting dates						Mean
	D1 (5th July)	D2 (15th July)	D3 (25th July)	D4 (5th August)	D5 (15th August)	D6 (25th August)	
V1 (N-53)	5.23	5.41	5.49	5.38	5.16	5.04	5.29
V2 (Nasik Red)	5.11	5.19	5.36	5.29	5.19	5.13	5.21
V3 (AFDR)	5.47	5.61	5.68	5.44	5.41	5.4	5.5
V4 (AFLR)	5.05	5.21	5.33	5.25	5.16	5.14	5.19
Mean	5.22	5.36	5.47	5.34	5.23	5.18	
CD(0.05%)	Variety		0.09				
	Date		0.18				
	Variety x Date		0.23				

measured with the help of vernier caliper. Agrifound Light Red recorded the lowest neck diameter (0.83 cm) whereas the highest value (1.02 cm) for this parameter was observed in cultivar N-53. The results obtained in the experiment also in close conformity

with those obtained by Bhonde *et al.* (2). They also obtained minimum neck diameter in cultivar Agrifound Light Red. The highest neck diameter (5.43 cm) among transplanting dates was observed on D₃ (25th July). The minimum value (0.88 cm) for

Table 5: Effect of varieties and date of transplanting on bulb weight (g) in onion(Pooled data for two years)

Varieties	Transplanting dates						Mean
	D1 (5th July)	D2 (15th July)	D3 (25th July)	D4 (5th August)	D5 (15th August)	D6 (25th August)	
V1 (N-53)	56.15	61.27	69.56	61.21	54.18	55.21	59.6
V2 (Nasik Red)	54.12	58.31	63.66	59.45	57.43	54.24	57.86
V3 (AFDR)	59.25	69.81	75.34	62.09	61.51	58.22	64.37
V4 (AFLR)	48.21	54.22	61.23	58.9	52.12	46.3	53.49
Mean	54.43	60.9	67.45	60.41	56.31	53.49	
CD(0.05%)	Variety		5.14				
	Date		7.21				
	Variety x Date		11.26				

Table 6: Effect of varieties and date of transplanting on total yield (q/ha) in onion(Pooled data for two years)

Varieties	Transplanting dates						Mean
	D1 (5th July)	D2 (15th July)	D3 (25th July)	D4 (5th August)	D5 (15th August)	D6 (25th August)	
V1 (N-53)	179.2	187.13	193.65	190.28	181.11	178.13	184.92
V2 (Nasik Red)	173.49	181.83	188.14	179.59	175.05	174.77	178.81
V3 (AFDR)	218.25	228.46	237.13	233.18	231.66	225.49	229.03
V4 (AFLR)	169.23	177.29	171.23	168.06	163.2	161.15	168.36
Mean	185.04	193.68	197.54	192.78	187.76	184.89	
CD(0.05%)	Variety		15.78				
	Date		9.34				
	Variety x Date		26.08				

this trait was recorded on the first transplanting date (5th July). Rest all effects and their interaction were statistically non-significant. The effect of varieties and Variety x Date interaction on neck diameter was found to be non-significant.

The lowest number of days harvesting (127.60 days) were observed in the cultivar AFLR and was significantly lower than Nasik Red (137.50 days). It was observed that delay in date of transplanting resulted in early maturity of onion bulbs. The highest days to maturity (142.00 days) were observed on first date of transplanting (5th July) whereas lowest days to harvest (121.80 days) were recorded on last transplanting date (25th August). The interaction effect of variety x date was also found to be significant for days to harvest with maximum values (149.00 days) in combination V_2D_1 (Nasik Red x 5th July) and minimum value (117.00 days) in combination V_4D_6 (AFLR x 25th August).

Perusal of data pertaining to bulb diameter (Table 4) showed that all the variables had significant effect on bulb diameter. The maximum bulb diameter value (5.50 cm) was noticed in cultivar Agrifound Dark Red. Mohanty and Prusti (8) obtained similar results when they evaluated the performance of common onion varieties in kharif season. They observed highest (5.00 cm) bulb diameter which was significantly higher than N-53 (4.90 cm) and Nasik Red (4.60 cm). The values of bulb diameter in cultivars N-53 and Nasik Red were statistically at par with each other. The highest bulb diameter was noted on third date of transplanting i.e. 25th July (5.41 cm). Earlier or delayed transplanting resulted in lower bulb diameter. The highest values of variety x date interaction (5.68 cm) was observed in combination V_3D_3 (AFDR x 25th July).

The weight of the bulb is directly proportional to bulb diameter. The highest bulb weight among cultivars was noted in cultivar AFDR (64.37 g) and the other two cultivars had bulb weight statistically at par with each other. The effect of transplanting dates followed similar trend as noted in case of bulb diameter and highest bulb weight (67.45 g.)

was noted on D_3 (25th July). Transplanting before or after 25th July resulted in lower weight of the bulb. The interaction effect of variety x date was higher in combination V_3D_3 (75.34 g).

Both varieties and transplanting time were observed to produce significant effect on bulb yield. The highest average yield (229.03 q/ha) was observed in cultivar AFDR. Whereas the lowest yield 168.36 q/ha was observed in AFLR. Similarly, the highest bulb yield (197.54 q/ha) among different transplanting dates was recorded on third transplanting date D_3 (25th July). Planting of sets on dates earlier (July) or after (September) this resulted in reduced bulb production. Transplanting in July was accompanied by higher sprouting of sets and better growth of the plants. Neerja et al (10), also observed that enhanced crop growth rate of onion resulted in efficient metabolism, thereby increased the sink capacity. Sharma *et al.* (13) and Kandil *et al.* (7) also advocated the role of transplanting dates on growth and yield of onion. Bhagchandani *et al.* (1) had also reported better performance of AFDR for kharif onion production. Similar results were also reported by Devet. *al.* (2005), who observed that highest yield of onion (195.86q/ha) in cultivar N-53 was obtained when it was transplanted in second fortnight of July under Hamirpur, Himachal Pradesh conditions. The interaction effect of variety x date for bulb yield was also significant and the highest values (237.13 q/ha) were observed in treatment combination V_3D_3 (AFDR and 25th July).

CONCLUSION

In the present investigations it was noticed that maximum values for yield contributing traits like bulb diameter, bulb weight and total yield were obtained in cultivar Agrifound Dark Red. All the varieties produced maximum yield when transplanted on the third date of transplanting i.e. 25th July. Therefore it can be summarized that cultivar Agrifound Dark Red is the best suited cultivar for Kharif onion production in lower hills of Himachal Pradesh and it should be transplanted around 25th July for maximization of bulb yield.

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