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Onion seedlings production response to different sowing methods and weed pressure

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ABSTRACT

An investigation was made to observe the influence of sowing methods and duration of weed competition on the production of onion seedlings. The experiment was laid out in split plot arrangements with Randomized Complete Block Design (RCBD). The data were recorded on the weed density m^{-2}, weed density (%), weed biomass m^{-2}, weed dry weight percentage, germination percentage, number of onion seedlings and seedling, weight. Sowing methods produced significant results in case of germination percentage. Statistically line sowing (9.524 kg) and weed free after 10 days of sowing (10.40 kg) produced maximum seedling weight $plot^{-1}$. As regards the weed density, the highest density of Convolvulus arvensis was recorded in the treatments. Besides, Euphorbia heliscopia, Chenopodium album and Rumex crispus also declined the growth rate of onion seedlings.

Keywords: *Allium cepa*, onion seedlings, production, weeds

During the short supply of onion in the country, the nation has been spending thousands of dollars from the hard to earn foreign exchange, on the import of onion. The onion (*Allium cepa)* belongs to Liliaceae or lily family. There are about 300 widely scattered species in the genus *Allium* and many of them have the characteristic onion flavour and odour. Besides provide nutrition, it imparts acceptable flavor to our dishes. Due to its enormous consumption, onion occupy a vital position both in acreage as well as production among the vegetables. Onion can be grown in the plains as well as hilly areas. The yields of onion realized in Pakistan are too low as compared to the advanced agricultural countries of the world. The major reason for the poor yield of onion is the excessive weed competition. Onion is a crop to which weeds pose a serious threat by declining the crop plant of nutrients, light, moisture and carbon dioxide. No studies under local conditions have been undertaken to investigate success of different planting methods and the most critical weed competition periods in onion nursery.

Yield were severely reduced by partial weed competition in onion. Cultivation and weeding have been reported to amount 40 per cent of the total cost production (Lockman, 1953). The period from emergence to 4 weeks later was the most critical for competition (Shadbolt and Holm, 1956). Weed control constitutes one of the principal costs of production in onion (Nyland *et al.,* 1958). Roberts (1973) concluded from his studies that onion need to be kept weed free for 12 weeks after emergence due the lack of vigorous foliage and inability to recover from competition. Thomas and Wright (1984) studied the influence of weed competition on onion. The studies showed that the crop was the most sensitive at the early stages of its growth. Bannon *et al.* (1988) concluded that onion yield were reduced by 62.91 and 99%, if weeds were allowed to persist for 2 and 3 weeks, respectively. Manjunath *et al.* (1989) reported that the presence of weeds affected plant height, bulb diameter, harvest index, bulb dry weight and bulb yield. Only. 1.54 t ha^{-1} were harvested in unweeded check as compared to 28.9 t ha^{-1} in wed free check and 33.87 t ha^{-1} in fluazifop butyl treated plots@ 0.5 k ha^{-1}. Warid and loaiza (1983) concluded that the yield of transplanted onion was higher as compared to the direct sown crop. Ahmad *et al*. (1994) evaluated Tribunil 70 WP, Ronstar 12 L and Probe 75 WP for controlling weeds of onion in D.I khan. Onion are the most non-competitive species to weeds. For achieving their higher economic yields, the weed free conditions are required to be maintained either mechanically or chemically (Hudda, 1997). The lesser time to germination was availed by the line sowing method as compared to the broadcast method (Ghafoor *et al.,* 2000). Keeping in view the importance of the subject, the present investigations were initiated to decipher the most critical periods of weed competition with planting regimes of onion nursery.

MATERIALS AND METHODS

An experiment was conducted on onion growth in its nursery phase affected by planting methods and weed pressure at Agriculture Research Station, Harichand. The experiment was laid out in a split plot in randomized complete block design with three replications. The main plots consist the sowing methods while the weed pressures were assigned to the sub plots. The sub plot size was kept at 2.5x2 m^2. Planting was done during the first week of November. The protocol of the experiment is detailed as under:

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Main plots:	**Sowing methods**
	1) Line sowing (rows spaced at 10 cm)
	2) Broadcast
Sub-plots:	**Weed competition periods**
	1) Weedy check (Weed free throughout the crop season)
	2) Weed free from 10, 20, 30, 40 and 50 days after emergence of the crop

Onion seed were sown on flat seed beds with the respective methods. The planting was done manually by using equal quantity of seed in both methods. The seed were covered either with sand or farmyard manure after planting with both methods. Standard agronomic practices such as irrigation, fertilizer application *etc.* for the onion crop were maintained constantly for all the treatments. The cultivar of onion was employed in the studies. The data were recorded for the weed density/ m^2, weed density (per centage), weed biomass/m^2, weed dry weight percentage, germination percentage, number of onion seedlings and seedling, weight. The data of all the above detailed parameters were individually subjected to the Analysis of Variance Technique (Steel and Torrie, 1989). Subsequently, the significant means were separated by the Least Significant Difference Test by using the MSTATC computer program.

RESULTS AND DISCUSSION

Weed density

The weed density m^{-2} for each specie was computed (Table 1). Several species were uprooted from the experiment on scheduled dates in each treatments. All the species uprooted from the experiment were broadleaf except *Desmotacya bipinnata*; which is very aggressive perennial noxious grass species. The overall means of the data showed that the highest number of weeds by the *Convolvulus arvensis* and was followed the *Chenopodium album*. The other species infesting the habitat were *Desmotachya bipinnata*, *Alhagi camelorum*, *Rumex crispus, Fumaria polymorpha, Euphorbia heliscopia* and *Melilotus parviflora* with in the descending order (Table 1). Workers around the world (Wicks *et al*., 1971; Gaffer *et al.*, 1993) have reported the occurrence of other weed species prevailing in their experiments on onion. This is believable due to variability in the macro and micro-ecological differences.

The weed density (%) for each species were computed. The perusal of the percent infestation data (Table 1) also revealed a similar trend, as in weed density m^{-2}, in the relative infestation of species. *Convolvulus arvensis* had the maximum population, followed by the *Chenopodium album*. Almost equal infestation of *Desmotachya bipinnata* and *Alhagi camelorum* was recorded in the trail. The least percent infestation was recorded in *Melilotus parviflora*. Workers around the world (Wicks *et al.*, 1973; Gaffer *et al.*, 1993) have reported the occurrence of other weed species prevailing in their experiments on onion. This is plausible due to variability in the macro and micro-ecological differences.

Weed biomass

The percentage-wise distribution of the specie revealed the similar pattern (Table 1). The predominant species *i.e Convolvulus arvensis* of infestation in experiment also possessed the highest biomass as well. For its perennial life cycle, it probably was the earliest to sprout due to its rhizomes already present in the soil in the fragmented form. Hence, due to its earliest space capture it could use most of the resources of the habitat viz. nutrients, water light and space. It was followed by *Chenopodium album* with weed biomass. Whereas the lowest weed biomass (5.64 gm^{-2}) was recorded in *Fumaria polymorpha.*

Dry weight of weeds

The mean dry weight of each specie was converted into the percentage of the total dry weight of all weeds. The data showed almost identical trend as for the fresh biomass as highlighted above. The *Convolvulus arvensis* has been the most aggressive to grab available resources into its canopy As high as 43.3% of the total dry matter assimilated by the weed species was contained by this species alone (Table 1). Another successful species of weeds in the studies was the *Chenopodium album*. It could isolate the dry matter to the extent of 20.68%. The weakest among invading flora was *Fumaria polymorpha*. It could hardly gather 5.94% of the dry matter content.

Germination

The main effects for main plots were significant statistically, whereas the ANOVA depicted non-significant differences of the sub-plots. When averaged across the replications and subplots, the lesser germination percentage was recorded in the broadcast sown method as compared to line sown crop. Similarly, when averaged across the replications and main-plots, no differences among weed competition periods were recorded. However, numerically the least germination was exhibited by 10 days after sowing, while the maximum germination among the sub-plots was recorded in the 30 days after sowing. As regards the interaction of the sowing methods with the weed competition periods, as shown in table 2, all the sub-plots involving line sowing, germinated earlier. The line

Table 1 : Influence of planting methods and weed competition periods on the onion seedlings.

English Name (Vernacular Name)	Botanical name	Life cycle	Weed Density		Weed Biomass ($g\ m^{-2}$)	Mean Dry Weight (%)
			No. m^{-2}	(%)		
Common Lamb-squarters (Bathu)	*Chenopodium album*	Annual	9.56	16.93 b	10.31 b	20.68 b
Field Bindweed (Vanverhi)	*Convolvulus arvensis*	Perennial	14.3 a	38.99 a	23.3 a	43.30 a
Johnson grass (Drab)	*Desmotachya bipinnata*	Perennial	7.63 c	12.01 bc	7.76 c	9.90 d
Camel's thorn (Jawanh)	*Alhagi camelorum*	Perennial	6.44 cd	12.73 bc	8.18 c	12.67 c
- (Pitpara)	*Fumarai polymorpha*	Annual	4.96 d	8.33 c	5.64 d	5.94 f
Curly dock (Khatak)	*Rumex crispus*	Annual	6.00 cd	11.05 c	7.21 c	9.51 d
Leafy spurge (Zahar Booti)	*Euphorbia heliscopia*	Annual	4.96 d	8.53 c	5.76 d	7.34 e
Indian clover (Senji)	*Melilotus parviflora*	Annual	4.81d	7.95 c	10.42 b	6.45ef

Note : Any two means not sharing a common letter(s) are significant at 5% level of probability.

Table 2 : Main and interaction effects as influenced by planting methods and weed competition on onion seedlings.

Competition periods	Sowing methods		Competition
	Line sowing	Broadcast	period means
Germination percentage	65.500 N.S.	54.500	60.00 N.S.
Weed free 10 DAS	64.000	52.000	58.00
Weed free 20 DAS	63.000	53.385	58.19
Weed free 30 DAS	64.666	55.755	60.21
Weed free 40 DAS	63.333	52.750	58.04
Weed free 50 DAS	65.055	53.110	59.08
Means	**64.259 N.S.**	**53.582**	
Seedling weight (kg)			
Weed free	10.333 N.S.	8.093	9.213 ab
Weed free 10 DAS	11.140	9.667	10.403 b
Weed free 20 DAS	7.587	8.367	8.027 a
Weed free 30 DAS	8.593	9.873	9.233 ab
Weed free 40 DAS	9.613	11.100	10.357 a
Weed free 50 DAS	9.880	6.153	8.017 a
Means	**9.541 N.S.**	**8.878**	
No. of onion seedlings (m^{-2})			
Weed free	107.00 N.S.	114.00	110.50 N.S.
Weed free 10 DAS	113.00	102.00	107.50
Weed free 20 DAS	105.00	115.00	110.00
Weed free 30 DAS	99.00	121.00	110.00
Weed free 40 DAS	108.00	127.00	117.50
Weed free 50 DAS	100.00	122.00	111.00
Means	**105.33**	**116.83**	

Note : Any two means not sharing a common letter(s) are significant at 5% level of probability.

sowing facilitated the germination by having comparatively looser soil onto the surface, whereas in the broadcast method the chance of reaching the onion seeds to the proper moisture and tilth were minimal, hence it did not allow the seed to germinate promptly. The highest score of germination was recorded in weed free treatment under the line sown method. Rao (1986) and Subramanian (1987) reported the superiority of transplanting method over the broadcast planting. However, identical research has not been reported in the available literature on the parameter studied.

Seedling weight

The main effects for main plots, and their interaction with sub-plots were non-significant statistically. When averaged across the replications and sub-plots, the lesser weight was uprooted from the line sown method as compared to the broadcast sown crop. Similarly, when averaged across the replications and main plots, differences among weed competition periods were recorded statistically for seedling weight (Table 2). The least weight was exhibited by weed free 50 days after sowing. However, it was statistically at par with 20, 30, and the weed free treatments. As regards the interactions of the sowing methods with the weed competition periods the differences were not real statistically, however, a spread in the data were recorded (Table2). Shadbolt and Holm (1956), Manjunath *et al.,* (1989) and Garcia *et al*., (1994) concluded the different weed competition durations as the critical for onion yield.

Number of onion seedlings

The data of the trait under reference as detailed in table 2, exhibited non-significant differences for the main effects for the main and sub-plots and their interaction. When averaged across the replications and sub-plots, statistically equal number of seedlings were uprooted from the line and the broadcast sown crop. Similarly, when averaged across the replications and the main plots, no differences among weed competition periods were recorded. However, numerically the least number was exhibited by the weed free 20 days after sowing , whereas, the maximum number of seedlings were recorded in the 40 days. As regards the interaction of sowing methods with the weed competition period, the least number of seedlings was counted in the weed free 50 days in line sowing method, while the maximum number was recorded in weed free 40 days with broadcast planting. Similar results were obtained by Ghafoor *et al.,* (2000)

REFERENCES

Ahmad Z, Baloch J.D., Munir M., and Nawaz G. 1994. Comparative efficacy of different herbicides and their time of application against weeds and the yield of the bulb onion (A*llium cepa* L.). *Pak J Weed Sci*. Res **7 :** 18-24.

Bannon C.D., Bhowmik P.C., and Morzuch B.J. 1988. Economic assessment of weed management systems in onion. In: *42nd Ann. Meetings Northeastern Wed. Sci. Soc.* USA, pp: 210.

Gaffer M.A., and Islam M.A. 1993. Critical period of weed competition in onion. Bangladesh J. Sci. Indst. Res. **28**: 68-75.

Garcia D.C., Barni V., and Storck L. 1994. Influence of the weed competition on the yield of onions bulbs. *Pesquisa Agropecuria Brasileira* **28** : 1557-63.

Ghaffoor A., Huda S., Hassan G., Waseem K., and Nadeem M.A. 2000. Growth response of onion seedlings against various duration of weed competition sown by different planting methods. *Sarhad J Agri* (In Press).

Huda S.K. 1997. Effect of planting methods and durations of weed competition on the growth of onion seedlings. *M.Sc. (Hons) Thesis*, Gomal University, Pakistan, pp. 59.

Lockman W.R. (1953). Weeding set onions with chloro-I.P.C. In : *American Soc. Hort. Sci.* **61**: 496-98.

Manjunath S., Panchal Y.C., Chimmad V.P., and Koti R.B. 1989. Studies on growth and yield of onion as influenced by herbicides and weeds J Maharashtra Agri. Univ. **14**: 200-203.

Nyland R.E., Nelson. D.C., and Dinkel D.H. 1958. Comparative costs of weeding onions by hand or with monuron CIPC and CDAA. Weeds **6**: 304-9.

Rao D.V., Reddy P.P., and Kumar R.V. 1986. Yield of Gall midge (G.M) resistant rice varieties after early pulse crop at Hyderabad IRRN **11**: 10.

Roberts H.A. 1973. Weeds and the onion crop. *J Royal Hort. Soc.* **98**: 230-32.

Shadbolt C.A., and Holm L.G. 1956. Some quantitative aspects of weed competition in vegetable crops *Weeds* **4**: 111-23.

Steel R.G.D., and Torrie J.H. (1989). *Principals and Procedures of Statistics*: McGraw Hill Book Co Inc New York, London.

Subramanian M,. Soundararai A.P.M.K., and SivasubramanianV. 1987 performance of broadcast seeded TM 8089.IRN **12**: 3-8.

Thomas M.N., and Wright C.G., 1984. A study of the factors affecting the onset of the critical periods of weed competition in onion crop. *Scientific Hort* **35**: 94-100.

Warid W.A., and Loaiza G.M. 1993. Effect of cultivars and planting methods on bolting and yield of short day onions. *Onion, Newsletter The tropics* **5:** 30-35.

Wicks G.A., Johnson D.N., Nuland D.S., and Kinbacher E.G. 1973. Competition between annual weeds and sweet spinach onions. *Weed Sci.* **21**: 436.39.