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## Screening the Local Varieties of Onion (*Allium cepa* L.) for Seed Production

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**Abstract:** The local varieties of onion (*Allium cepa* L.) viz. Bannu local, Bilot Kacha local, Dhakki local, Dhallah local, Naurang local, Paniyala local, Peshawar local, Shah Alam local, Swat-1 and Tank local were evaluated for seed production. The study was conducted at the Faculty of Agriculture, Gomal University, D.I. Khan during 1999. Data on different growth and seed yield parameters were recorded and statistically analyzed. Almost all growth parameters differed significantly ( $P=0.05$ ) except flower stalk and umbel diameter. The highest seed weight per umbel (5.800 g) was harvest in the Peshawar local while the lowest (3.417 g) in Bannu local. The seed yield  $\text{ha}^{-1}$  and 1000 seed weight significantly ( $P=0.05$ ) differed amongst the varieties. The highest seed yield (192.20  $\text{kg ha}^{-1}$ ) was obtained in the Cv Naurang local which was statistically at par with Paniyala local, Shah Alam local and Swat-1 and significantly higher than the other varieties. The lowest seed yield 447.25  $\text{kg ha}^{-1}$  was obtained from onion variety Tank local. The 1000 seeds weight of Naurang local, Shah Alam local and Swat-1 were found as the better seed yielders and are suitable for seed production under D.I.Khan condition.

**Key words:** Seed production, onion, local varieties

### Introduction

Onion (*Allium cepa* L.) belongs to the family Amaryllidaceae (amaryllis) or liliaceae and is one of the most important monocotyledonous, cross-pollinated and cool season vegetable crop. It originated in Afghanistan, Tajikistan and Uzbekistan, western Tien Shan India, western Asia and the area around the Mediterranean sea. (Baloch, 1994).

Since ancient time, it has been of great economic importance due to medicinal and dietetic values. It is widely used as a condiment all over the Latin America, Africa and Asia. Onion is extensively used as condiment in the preparation of curry, chutney and pickle etc. In Pakistan almost all spicy dishes contain onion as one of the important ingredient used for culinary purposes. People consider it an indispensable part of human diet and is commonly used both by rich and poor.

Onions can be grown under a wide range of climatic conditions but are more successful under mild season without extremes of heat or cold and excessive rainfall. In places where annual rainfall exceeds 75-100 cm, the onion does not thrive well (Shanmugavelu, 1990).

According to the agricultural statistics of Pakistan (1999-2000) onion was grown over an area of 87.1 thousand hectares with total production of 1648.0 thousand tones. Out of which onion crop in NWFP occupied 9.9 thousand hectares with a total production of 147.0 thousand tones. Standard seed production technology is an important factor to achieve the maximum yield in most of the vegetables. Masuda and Hayashi (1956) reported that Thrips, bad weather (high rain fall and humidity) during flowering, infection by downy mildew and lack of

sunshine in the ripening period tended to reduce seed yield in Japan. Mishra (1994) performed experiment on the seed production of Patna red bulbs. Application of 120  $\text{kg N ha}^{-1}$  significantly increased the number of flowering scapes, umbel size, seed yield and seed germination. Potash alone had no effect but in combination with N gave positive results. Applying 120  $\text{kg N} + 40 \text{ kg K ha}^{-1}$  gave the best result in terms of the number of flowering scapes, umbel size and seed yield. This combination produced the highest seed yield of 499 and 555  $\text{kg ha}^{-1}$  and germination of 82 and 87% during first and second year, respectively.

Ali *et al.* (1998) obtained maximum seed yield (335.56  $\text{kg ha}^{-1}$ ) when planted at 10 cm spacing, although single plant yield and 1000 seed weight were significantly higher in plants spaced at 30 cm apart. The larger bulb size (5.5-7.0 cm diameter) produced significantly higher seed yield than smaller sized bulbs (3.5-4.5 cm diameter). Islam *et al.* (1990) studied the influence of set sizes, spacing and nitrogen levels on the growth and bulbs yield of onion at Bangladesh Agriculture University, Mymensing, during 1997-98 and reported the maximum yield of 33.7  $\text{t ha}^{-1}$  from the combination of large set and close spacing and 120  $\text{kg N ha}^{-1}$ . Quite a large number of onion varieties are given in the southern part of NWFP, therefore, the present study was conducted to screen the best varieties for better seed production.

### Materials and Methods

The research work was carried out at the Horticulture Research Area of Faculty of Agriculture, Gomal University, D.I.Khan. The experiment was laid out in

Randomized complete Block design (RCBD) with three replications. Ten local varieties were planted on a well-prepared ridges (1.8x2.1 m) with row to row distance of 60 cm and bulb to bulb distance of 30 cm. Crop received 15 irrigation's and three hoeing to eradicate the weeds and to improve soil aeration, Recommended dose of fertilizer was applied @ 120-60-60 kg ha<sup>-1</sup> NPK. Nitrogen was applied in two split doses, the first half dose along with phosphorus and potash at the time of soil preparation while the remaining half was applied 30 days after the sowing.

All the required cultural practices such as irrigation, weeding, insect pest and disease control measures etc were given uniformly to all the varieties. Data were recorded on time taken to sprouting (days), number of leaves plant<sup>-1</sup>s, length and width of the leaf, number of shoots, days taken to flowering, number of flower stalk plant<sup>-1</sup>, length of the flower stalk, diameter of the stalk, number of flower per umbel, diameter of the flower, number of seeds per umbel, weight of the seeds per umbel, weight of thousand seeds, seed yield in grams per plot and seed yield in kg ha<sup>-1</sup>. Data collected in various parameters were analyzed statistically using analysis of variance technique as described by steel and Torrie (1980) and Duncan's Multiple Range test (Duncan, 1955) was used to check the differences among treatment means.

## Results and Discussion

### Number of days taken to first sprouting of onion bulb:

Data concerning the number of days taken to first sprouting are given in Table 1 which shows that varieties differ significantly from each other among the varieties Dhakki local and Paniyala local took maximum time for sprouting (8 days) which were statistically at par with each other and differed from other varieties. However, Bannu local, Bilot Kitcha, Dhallah local, Peshawar local, Shah Alam local, Swat-1 and Tank local took 6 days for sprouting.

### Days taken to complete sprouting of onion bulbs:

Days completion of sprouting are a good indicator for final seed maturity. The data (Table 1) revealed significant differences among cvs regarding completion of sprouting. The minimum of 8 days for completion of sprouting were recorded in Peshawar local, Shah Alam local and Swat-1 which were significantly lesser than other onion varieties. The onion variety Panyala local took the maximum (14 days) for completion of sprouting which were highest than all other varieties.

**Number of leaves plant<sup>-1</sup>:** The photosynthetic material synthesized in the leaves flow down to the root zone for

bulb formation. Hence the number of leaves is one of the most important measures of the plant vigor. The number of leaves plant<sup>-1</sup> differed significantly among the varieties (Table 1). The maximum number of leaves (80.33) was observed in Peshawar local which differed significantly from all other varieties. The significantly lowest number of leaves (18.40) was produced in Tank local. However, the number of leaves in other varieties varied from 20-66. Nehra *et al.* (1988) and Bhatia and Pandey (1991) reported that this parameter is directly related to varietal characteristics.

**Length and width of leaf:** Leaf is a food manufacturing factory. Leaf width is directly related with photosynthesis as it provides more area for photosynthetic activity which consequently affects the yield. The varieties showed significant variation with respect to leaf width. Leaf width ranged from 0.23 to 0.5 cm (Table 1). The highest being in Bilot Kacha and lowest in Naurang local.

The data (Table 1) revealed that there was the length of leaf differed among the varieties. The largest leaves (42.66 cm) were measured in Dhakki local followed by Tank local (38.33 cm) but both varieties were statistically similar. The length varied from 42.66-24.89 cm. The shortest leaves (24.88 cm) were observed in Bannu local.

**Number of shoots plant<sup>-1</sup>:** The number of shoots is a yield component and is very important in seed yield. The mean number of shoots plant<sup>-1</sup> reported in Table 1 depicted significant variations among the cultivars. The maximum number of shoots (13.13) plant<sup>-1</sup> was recorded in Peshawar local variety followed by Naurang local with 9.7 shoots per plan. But both differed significantly from one another. Onion variety Bilot Kitcha produced the lowest (2.46) number of shoots plant<sup>-1</sup>. However, it was at par with the Dhakki local and Tank local which contained the average of 2.53 shoots plant<sup>-1</sup>.

**Time taken to flowering (days):** Time taken to flowering initiation by different varieties varied significantly. The varieties took 70-78.7 days for flower initiation Table 2. The maximum days take to flowering (78 days) were recorded in Swat-1 and Shah Alam. The minimum days taken to flowering (70 days) were recorded in Peshawar local. Early flowering is an indicator of early maturity. Early maturing varieties usually escape from bad weather and diseases, subsequently produce good seed yield. Peshawar local, Paniyala local, Dhakki local and Bannu local are classified as early maturing varieties. Similarly, Swat-1, Shah Alam local, Bilot Kacha local, Naurang local, Tank local and Dhalla local varieties are regarded as late maturing varieties.

Table 1: Days required to initiation and completion of sprouting, number of leaves plant<sup>-1</sup>, length and width of leaf and No. of shoots plant<sup>-1</sup>

Varieties	Days required to first sprouting	Days required to complete sprouting	Number of leaves plant <sup>-1</sup>	Length of the leaf (cm)	Width of the leaf (cm)	Number of shoot plant <sup>-1</sup>
Bannu local	6b	11b	44.733de	24.887e	0.273c	6.067cd
Bilot kacha	6b	11b	18.467f	31.778cd	0.497a	2.467e
Dhakki local	8a	11b	20.533f	42.663a	0.430ab	2.533e
Dhallah local	6b	11b	36.400e	34.333bc	0.260c	5.267d
Naurang local	6b	11b	66.000b	29.663d	0.230c	9.733b
Pahiyala local	8a	14a	48.667cd	31.107cd	0.410ab	7.837bc
Peshawar local	6b	8c	80.333a	27.217de	0.300bc	13.133a
Shah Alam local	6b	8c	59.788bc	27.773de	0.253c	7.867bc
Swat-1	6b	8c	52.667cd	37.110b	0.243c	6.600cd
Tank local	6b	11b	18.400f	38.327ab	0.340bc	2.533e

Table 2: Days taken to flower initiation completion flowering, number of flower stalk plant<sup>-1</sup>, length of flower stalk, diameter of flower stalk and no. of flower/umbel

Varieties	Days time taken to flower initiation	Days required to complete sprouting	No. of flower stalk plant <sup>-1</sup>	Length of the flower stalk (cm)	Diameter of flower stalk (cm)	Number of flower per umbel
Bannu local	75.667bc	131.667e	9.267c	50.887de	0.877	234.000b
Bilot kacha	78.000a	145.333a	3.600d	43.997e	2.943	242.833b
Dhakki local	74.333c	147.333a	4.267d	45.997e	1.055	146.333c
Dhallah local	77.333ab	142.333cd	10.000c	66.440ab	1.269	275.600a
Naurang local	77.667ab	142.667bc	19.200a	56.883b-d	0.970	247.467ab
Pahiyala local	75.000c	138.333d	16.133ab	65.110a-c	0.953	222.667b
Peshawar local	70.000d	143.667bc	15.867ab	54.440c-e	0.860	246.733ab
Shah Alam local	78.000a	148.000a	15.267b	57.997b-d	1.120	224.000b
Swat-1	78.667a	143.333a	12.400bc	69.950a	1.140	237.800b
Tank local	77.333ab	133.667e	5.200d	49.440de	1.070NS	222.933b

Table 3: Diameter of umbel, number of seed/umbel, weight of seeds in three umbel, seed yield/plot, seed yield in kg ha<sup>-1</sup> and weight of thousand seeds

Varieties	Diameter of umbel (cm)	Number of seed per umbel	Weight of seed/ three umbel	Onion seed yield (gm)	Onion seed yield kg ha <sup>-1</sup>	Weight of 1000 seed
Bannu local	5.020	263.667bc	3.417	52.167b	137.98b	4
Bilot kacha	6.310	319.000b	3.467	53.433b	141.33b	3
Dhakki local	7.072	227.888c	3.517	18.033c	47.69c	4
Dhallah local	4.947	253.333bc	3.867	51.600b	136.48b	3
Naurang local	4.770	291.000bc	4.400	72.667a	192.20a	4.2
Pahiyala local	4.948	448.000s	3.633	69.900a	184.88a	4.2
Peshawar local	4.413	282.333bc	5.800	52.033b	137.62b	3.5
Shah Alam local	4.807	320.000b	3.517	62.467a	165.22a	4.2
Swat-1	5.407	250.333bc	3.833	61.533a	162.75a	4.2
Tank local	6.603NS	270.333bc	5.467NS	17.867c	47.25c	4

**Days taken to completion of flowering:** The varieties took 133.7-148 days for completion of flowering. The means (Table 2) indicated that onion varieties differed (P=0.05) significantly with respect to days taken to complete flowering. Onion varieties Shah Alam local took maximum time (148 days) to complete flowering and was at par with Bilot Kacha, Dhakki local and Swat-1. The onion variety Bannu local and Tank local completed flowering in the shortest period (131 days).

**Number of flower stalks plant<sup>-1</sup>:** A perusal of the means (Table 2) depicted that onion varieties differed significantly (P=0.05) in the number of flower stalk produced. The highest number of flower stalk (19.2) were recorded in cv Naurang local which statistically at par with the number of flower stalks produced in Panyala and Peshawar local and were higher than the flowering stalk observed in the other onion varieties. The lowest (3.6) number of flowering stalk were found in Bilot Kacha was

statistically alike to cvs Dhakki local and Tank local which produced 4.27 and 5.20 flower stalks plant<sup>-1</sup> respectively.

**Length of flowering stalk plant<sup>-1</sup> (cm):** The length of flower stalks varied from 43.99 to 69.95 cm. The flowering stalk length averages are presented in Table 2. The means showed the flowering stalk length were statistically different among the onion varieties. The maximum length (69.95 cm) of flower stalk was recorded in Swat-1 which was at par with Dhallah local and Paniyala local with 66.44 and 64.4 cm flower stalks respectively. The lowest length (43.99 cm) of flowering stalk was shown in cv Bilot Kacha.

**Diameter of flower stalk (cm):** As regards diameter of flower stalk, the data reported in Table 2 showed that onion varieties used in this study did not differ significantly. Flower stalk diameter measured between 0.86-2.94 cm being maximum in Bilot Kacha and minimum in Peshawar local.

**Number of flowers per umbel:** The number of flowers umbel is a very important yield component contributing to final seed yield. The means reported in Table 2 revealed significant variations in the number of flowers per umbel among onion varieties used in this study. The Cv Dhalla local produced the highest (275) numbers of flowers per umbel. It was significantly different from other onions varieties except Naurang local and Peshawar local with 247.46 and 246.73 flowers per umbel respectively. Dhakki local produced the lowest (146.33) significant number of flowers per umbel.

**Diameter of umbel (cm):** The means Table 3 showed that onion varieties used in this study were statistically the same with regards to diameters of umbel. However, the maximum diameter of umbel (7.072) cm was recorded in Dhakki local whereas the minimum diameter of the umbel (4.41 cm) was observed in Peshawar local.

**Number of seeds per umbel:** The average number of seeds per umbel for different onion varieties is given in Table 3. Onion varieties differed significantly regarding the number of seeds per umbel. The onion variety Paniyala local produced the significantly maximum (448) number of seed per umbel which was significantly highest than all the onion varieties used in the screening. The lowest number of seeds per umbel (227.9) were collected in Dhakki local. However, it was significantly similar to Bannu local, Dhalla local, Naurang local, Peshawar local, Swat-1 and Tank local.

**Seed weight (g)/three umbels:** The averages of mean seed weight of three umbels (Table 3) indicated that there was no significant difference among onion varieties. However, the highest seed weight (5.8 g) was recorded in the onion variety Peshawar local followed by Tank local (5.40 g) and Naurang local (4.40 g). The lowest seed weight of 3.42 g was observed in Bannu local.

**1000 seed weight (g):** Thousand seed weight depicted in Table 3 showed that onion varieties failed to reveal any significant variation. The 1000 seed weight ranged from 3-4.2 gm. Ali *et al.* (1998) also reported no significant variation in the weight of 1000 seeds among different varieties.

**Seed yield per plot:** Means in Table 3 showed that seed yield per plot was affected significantly due to different varieties. The highest seed yield of 72 g/plot was obtained from Naurang local followed by Panyala local, Shah Alam local and Swat-1. All the four varieties produced significantly similar yield. The lowest yield/plot of 17.86 g

was observed in Tank local which was statistically similar to Dhakki local which procured 18.03 g seed yield per plot.

**Seed yield in kg ha<sup>-1</sup>:** A perusal of the average seed yield ha<sup>-1</sup> (Table 3) indicated that onion varieties differed significantly ( $P < 0.05$ ) in producing seed yields. The highest seed yield of 192.2 kg ha<sup>-1</sup> was harvested in the onion variety Naurang local followed by Paniyala local, Shah Alam local and Swat-1 with 184.8, 165.2 and 162.7 kg ha<sup>-1</sup> respectively. These varieties produced statistically similar yield. Tank local varieties and Dhakki local proved to be the lowest seed yielder and are not recommended for seed production. Our findings are in agreement with Baldev *et al.* (1983) and Patil and Patil (1990) who evaluated different onion cvs for seed production and reported significant variations.

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