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Effect of root size on seed yield and quality of the turnip cv. Purple Top White Globe

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Abstract

The turnip cv. Purple Top White Globe was sown in mid August at Vegetable Research Station, Kalpa, District Kinnaur (HP) and the roots overwintered in trenches from November to March during the consecutive years 2007-08 and 2008-09. Root to seed method was followed for seed production. True to type roots were grouped into seven classes viz. S1: 26-50g; S2: 51-75g; S3: 76-100g; S4: 101-125g; S5: 126-150g; S6: 151-175g and S7: 176-200g. The field experiments were conducted in Randomized Block Design with three replications. After melting of snow in the last week of March to first week of April true to type roots of appropriate sizes were planted in respective experimental plots. Significant differences were observed for all the traits studied except seed quality, pod length and maturity during both the years. The plants from larger roots produced more seed yield, number of branches, pods, seeds per pod and height, besides being early in sprouting, flowering and pod formation with low mortality. However, seed quality traits viz. 1000 seed weight and germination percentage as well as pod length and days to maturity were not affected by the root size. It could be concluded that true to type bigger sized roots (>150g) should be selected for getting higher seed yield in turnip.

Key words: Turnip, seed yield, root size, quality.

Introduction

Turnip (*Brassica rapa* L.) is an important root vegetable grown extensively during winter in plains and through out the year in the hills. There are two types of turnip cultivars viz. Asiatic and European. The latter requires chilling temperature (below 40^0 F for 3-4 months) for entering into reproductive phase, hence can be grown only in the temperate regions as a seed crop. The dry temperate zone of North Western Himalayas is congenial for seed production of turnip. Root to seed method is generally followed where roots after selection are stored in trenches for overwintering and seed so produced is of high quality. Due to slow rise in temperature from March to August and prevalence of dry condition at the time of seed maturity and harvest, the seed produced in this region is of high quality and excellent vigour. A wide variation noticed in the size of even the true to type roots at the time of selection and preparing root stecklings for seed production, puts the seed producers in a fix, as to what sized roots should they select? Only a few studies on the effect of steckling size on seed yield and quality have been made in India with the turnip cv. Purple Top White Globe (Saini, 1971 and Verma *et al.*, 1993). Since the earlier studies were based on root diameter, it was thought appropriate to use root weight (easier to be recorded) to classify the roots into different sizes and study their effect on seed yield and quality under the conditions prevailing at Kalpa (Kinnaur), Himachal Pradesh.

Materials and Methods

The present investigations were carried out on turnip cv. Purple Top White Globe during the consecutive years 2007-08 and 2008-09 at Vegetable Research Station, Kalpa, District Kinnaur (HP). The healthy seeds were sown in mid August and the roots overwintered in trenches from November to March. Turnip seed production was done by root to seed method and the true to type roots were grouped into seven classes viz. S1: 26-50g; S2: 51-75g; S3: 76-100g; S4: 101-125g; S5: 126-150g; S6: 151-175g and S7: 176-200g. The field experiments were conducted in Randomized Block Design with three replications. After melting of snow in the last week of March to first week of April stecklings as per treatments were planted in plots of the size 2.40 x 2.40 m at 60 x 30 cm spacing, thereby accommodating 32 stecklings per plot. The observations were recorded on seed yield per plant (g), number of branches per plant, pods per plant, seeds per pod, pod length (cm), days to 50% sprouting, flowering, pod formation, maturity, mortality (%), plant height (cm), 1000 seed weight (g) and seed germination (%).

Results and Discussion

The data on seed yield and components, maturity and seed quality traits in different treatments are presented in Table 1. Significant differences were observed for all the traits studied except seed quality measured in terms of 1000 seed weight and germination percentage, besides pod length and days to maturity during both the years. The highest seed yield of 53.07g per plant was obtained by replanting the roots of 151-175g size, however, it was at par with roots weighing 176-200g, whereas, the performance of roots below 150g was significantly poor. Almost similar trend was observed for branches per plant, pods per plant, seeds per pod and plant height. The maximum number of branches per plant (64.25), pods per plant (1525.60) and seeds per pod (16.69) were observed in 151-175g size, which were at par with the roots weighing 176-200g. Similarly the maximum plant height (95.47 cm) was recorded in 176-200g, which was at par with all other roots weighing above 100g. The performance of smaller roots was poor. One of the important factors which can affect crop growth is the initial vigour, in the form of seed or turnip root size. Dhesi *et al.* (1965) observed that bold seeds were significantly better over medium and small in producing greater weight of roots. In the present studies, the initial vigour of the root at the time of replanting appears to have a major role in increasing seed yields. Large sized roots had more storage of food material and water content and as such plants from these roots could withstand more adverse conditions by way of less mortality, more number of branches and a tendency to be taller than plants from smaller roots. These factors led to higher seed yield indicating thereby that plants from large roots had a greater potential for high seed yields. So the superiority of large size roots could be due to their favourable effect on plant height, number of branches per plant and hence more number of pods per plant and also production of more seeds per pod. These results are in agreement with those obtained by Saini *et al.* (1971), Sharma and Lal (1986) and Singh *et al.* (1989).

Increased seed yield and other related characters with bigger root size have also been reported by Verma *et al.* (1993).

The roots larger than 151g sprouted, flowered and came into pod formation stage significantly earlier than the smaller ones and also their mortality percentage was low. The turnip plants from root size 176-200g sprouted (13.25 days), flowered (24.09 days) and came into pod formation stage (31.17 days) at the earliest which were at par with the roots larger than 100g, 150g and 125g, respectively. The minimum mortality (5.72%) was observed in the plants from root size 151-175g which was statistically at par with those from root size 176-200g. These results are in conformity with those of Saini *et al.* (1971) who had reported that mortality of roots was significantly lower in plants with large sized roots. However, Verma *et al.* (1993) observed non-significant effect of root size on mortality but in their experiment the smallest sized roots were of 160g while in the present studies it corresponded with S6: 151-175g root size. In contrast, Singh *et al.* (1989) reported that number of days to 50% bolting were not influenced by root size.

In order to ascertain the effect of root size on the quality of seed, 1000 seed weight and seed germination percentage were recorded and the differences for both the traits were found non-significant in all the years. Ranges of 2.23-2.36g for 1000 seed weight and 91.92-96.46% for seed germination were recorded in all the root size treatments studied. Seed germination from all root sizes were considerably higher due to low rainfall at seed maturation and harvesting. Saini *et al.* (1971) have reported that root size had no effect on seed size and viability which was also confirmed by Verma *et al.* (1993) for the seed germination trait. However, the present studies are at variance with those of Singh *et al.* (1989) and Verma *et al.* (1993) who have reported increase in 1000 seed weight with increase in root size.

Table 1. Effect of root size on seed yield and quality of turnip cultivar PTWG

Trait	Seed yield/plant (g)			Branches/plant (No.)			Pods/plant (No)			Seeds/pod (No.)			Pod length (cm)			Days to 50% sprouting (No)		
Root size	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled
S1 26-50g	26.44	21.84	24.14	41.01	39.12	40.07	709.84	612.14	660.99	12.1	10.35	11.25	4.27	4.31	4.29	17.00	18.67	17.84
S2 51-75g	32.18	35.16	33.67	45.76	49.27	47.52	841.36	791.39	816.38	11.3	12.37	11.78	4.29	4.19	4.24	15.67	17.00	16.34
S3 76-100g	37.57	35.36	36.47	47.89	45.38	46.64	926.67	896.32	911.50	12.7	10.82	11.77	4.28	4.48	4.38	16.33	18.50	17.42
S4 101-125g	41.38	43.81	42.60	53.75	51.29	52.52	1010.71	916.22	963.47	14.7	13.27	13.97	4.36	4.32	4.34	14.67	14.00	14.34
S5 126-150g	46.71	45.69	46.20	58.42	53.53	55.98	1226.34	1136.81	1181.58	15.8	12.18	14.01	4.51	4.41	4.46	13.67	15.33	14.50
S6 151-175g	52.96	53.18	53.07	66.34	62.15	64.25	1479.55	1571.65	1525.60	17.2	16.14	16.69	4.76	4.39	4.58	14.67	13.33	14.00
S7 176-200g	54.02	51.92	52.97	63.78	61.91	62.85	1522.91	1419.62	1471.27	16.7	14.86	15.81	4.53	4.66	4.60	14.00	12.50	13.25
Mean	41.61	40.71	41.16	53.85	51.81	52.83	1102.48	1038.88	1070.68	14.4	12.86	13.62	4.43	4.39	4.41	15.14	15.62	15.38
CD (P=0.05)	5.88	4.97	5.43	7.34	6.68	7.01	197.23	176.29	186.76	2.08	1.91	2.00	NS	NS	NS	2.35	2.15	2.25

Trait	Days to 50% flowering			Days to 50% pod formation			Mortality (%)			Maturity (days)	Plant height (cm)			1000-seed weight (g)			Seed germination (%)		
Root size	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled	2008 &09	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled
S1 26-50g	26.67	28.00	27.34	36.00	35.33	35.67	19.11	16.72	17.92	105	72.76	73.18	72.97	2.25	2.31	2.28	94.50	91.50	93.00
S2 51-75g	28.67	29.67	29.17	36.00	37.67	36.84	17.44	14.45	15.95	105	84.37	76.12	80.25	2.16	2.46	2.31	91.75	93.00	92.38
S3 76-100g	27.67	29.33	28.50	35.67	36.00	35.84	18.32	17.81	18.07	105	78.44	83.64	81.04	2.27	2.18	2.23	97.17	95.75	96.46
S4 101-125g	27.67	29.50	28.59	37.33	38.50	37.92	11.78	12.71	12.25	105	87.71	82.52	85.12	2.36	2.19	2.28	96.08	93.67	94.88
S5 126-150g	29.33	28.00	28.67	34.00	35.33	34.67	9.57	8.62	9.10	105	89.94	84.68	87.31	2.31	2.41	2.36	92.67	91.17	91.92
S6 151-175g	26.00	26.67	26.34	32.67	33.50	33.09	6.19	5.25	5.72	105	95.68	91.86	93.77	2.41	2.22	2.32	95.58	96.50	96.04
S7 176-200g	24.67	23.50	24.09	31.67	30.67	31.17	7.71	4.39	6.05	105	97.17	93.77	95.47	2.37	2.29	2.33	94.75	95.50	95.13
Mean	27.24	27.81	27.53	34.97	35.29	35.13	12.87	11.42	12.15	105	86.58	83.68	85.13	2.30	2.29	2.30	94.64	93.87	94.26
CD (P=0.05)	3.12	3.34	3.23	4.01	4.22	4.12	2.25	2.11	2.18	NS	11.46	9.78	10.62	NS	NS	NS	NS	NS	NS

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