

EFFECT OF DEHAULMING ON YIELD OF SEED POTATOES

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Abstract

The yield of seed size tubers was assessed in five standard potato cultivars (Cardinal, Multa, Ailsa, Heera, and Dheera) in relation to dates of dehaulming (65, 70, and 80 days after planting) in a Seed Potato Production Farm, Debijong, Panchagarh during 1996-97 and 1997-98. Dehaulming at 70 days gave maximum seed size tubers (19.75 t/ha \approx 76%) but significantly identical to 75 days (19.56 t/ha \approx 70%) and 80 days (18.69 t/ha \approx 63%). Considering all the parameters studied, the performance of Heera proved to be best among the cultivars grown. Among the cultivars, the maximum seed tuber yield was recorded from Cardinal at 80 DAP followed by Heera and Cardinal at 70 DAP, Dheera and Ailsa at 75 DAP. In general, most of the cultivars gave the maximum seed tuber yield when the crop was dehaulmed at 70 and 80 DAP and the lowest from 65 DAP.

Key Words: Dehaulming, potato, seed production.

Introduction

The national average yield of potato in Bangladesh is around 12.60 t/ha, which is lower compared to neighbouring country, India (16 t/ha). The major limiting factor for this low yield of potato is the non-availability of quality seed potatoes. In Bangladesh, about 200 thousand tons of seed potatoes are planted annually. Of them, only 7 thousand tons of certified grade are produced and supplied by the government agency. Another 7 thousand tons are produced and distributed by other agencies (private and NGO sector). Thus, it is calculated that only 7.0% of the total seed requirement are of good quality and the rest 93.0% are of poor quality. This figure indicates that there is a tremendous demand of quality seed in the country.

Seed production agencies in the country followed a standard method which involved pre-foundation seeds (local or imported)→ foundation seed (local or imported)→ certified seed-I (local/imported)→Certified-II (local) → distribution to farmers. Seed production is a highly technical matter which needs careful attention in all stages like date of planting, spacing, fertilization, top-dressing, irrigation, weeding, earthing up, spraying of pesticides, date of dehaulming, harvesting, etc. Removal of above ground part of potato crop is referred to dehaulming. The existing ratio of seed potato yield to total yield is about 0.6:1.0

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(Anon., 1994) which could be improved through agronomic management. Hence, the experiment was undertaken to increase the proportion of seed size tuber through dehaulming at appropriate time.

Materials and Method

The experiment was conducted at the Seed Potato Production Farm, Debiganj, Panchagarh of AEZ 3 during 1996-97 and 1997-98. The treatments were 5 (five) cultivars, such as Cardinal, Multa, Heera, Ailsa, and Dheera and 4 (four) dates of dehaulming (65, 70, 75, 80 DAP). Seed size (40-60g) whole tubers were planted at 60 cm x 30 cm spacing on 18 November 1996 and 15 November 1997. The unit plot size was 3m x 3m. The initial nutrient status of soils of the experimental plots was 17, 9, 3, and 6 µg/ml of NH₄-N, P, Zn, and S, respectively, and 0.10, 1.9, and 0.65 meq/100 ml of K, Ca, and Mg, respectively, and organic matter was 0.73%. The pH of the soil was 6.4. The soil type of the experimental site was sandy loam and the crops were fertilized @ 250 kg urea, 220 kg TSP, 200 kg MP, 120 kg Gypsum and 6 kg boric acid per hectare. Full dose of TSP, MP, Gypsum, boric acid, and one half of urea were applied during land preparation and the rest one half of urea was side dressed during first earthing up and weeding operations, 30 days after planting (DAP). The crops were irrigated four times and were regularly sprayed at 10 days interval with 0.2% desis. The experiment was conducted in a factorial randomized complete block design replicated thrice. The crops were harvested after 10 days of haulms cutting. Data on seed yield of seed tubers and yield attributes were recorded and analyzed statistically.

Results and Discussion

Effect of cultivars on seed yield

The cultivars did not show any significant variation for different parameters over the years so the pooled data were done and are presented in Table 1-3. The cultivars differed significantly for most of the parameters studied (Table 1). The cv. Cardinal showed the highest number of tubers per hill (14.56) which was statistically superior to all other treatments. The other treatments were statistically at par but lower than the previous one. The cv. Heera gave the maximum tuber weight per hill (533.50 g), which is corresponding to the highest total yield (29.54 t/ha) and seed tuber yield (19.27 t/ha). The highest total yield was recorded from cv. Heera, but seed yield was not significantly influenced through non-seed yield from the same variety. In terms of seed tuber percentage, Multa was the best (72.60%) followed by Ailsa (71.82%) and Dheera (71.74%). A similar trend in reverse order for non-seed portion was observed, where Multa was the least (1:0.377) and Heera the highest (1:533).

Table 1. Seed yield of five potato cultivars as influenced by dates of haulm cutting during 1996-97 and 1997-98 (pooled).

Cultivars	Tubers/hill	Wt. of tubers/hill (g)	Yield (t/ha)	Seed yield (t/ha)	Percent seed tuber	Yield of non-seed tuber (t/ha)	Percent non-seed tuber	Ratio (seed: non-seed)
Cardinal	14.56	491.50	27.22	18.88	69.36	8.34	30.64	0.442
Multa	13.28	447.00	24.81	18.01	72.60	6.80	27.40	0.377
Heera	12.87	533.50	29.54	19.27	65.23	10.27	34.77	0.533
Ailsa	12.78	450.00	24.98	17.94	71.82	7.04	28.18	0.392
Dheera	13.27	443.00	24.61	17.65	71.74	6.95	28.26	0.394
LSD (5%)	1.11	36.85	2.36	1.54	2.64	1.02	2.21	0.09

Effect of haulm cutting on seed yield

The number of tubers per hill ranged from 12.08 to 15.06 (Table 2). However, this parameter is not related to haulm cutting because tuber formation in potato is almost completed within 50 days (Beukema and Zaag, 1990). The weight of tubers per hill increased gradually. It was 384.20 g when haulm was cut at 65 DAP, which arose upto 533.00 g at 80 DAP. The result of 80 DAP was statistically similar to 75 DAP (505.60 g). Haulms cut at 75 and 80 DAP gave statistically almost similar tuber yield (28.02 and 29.57 t/ha, respectively, (Table 2). It was 26.02 tons for 70 DAP and the least was for 65 DAP (21.30 t/ha). The maximum seed yield was 19.75 t/ha) at 70 DAP, which was statistically identical to 75 (19.56 t/ha) and 80 (18.69 t/ha) DAP. The seed yield at 65 DAP was the poorest (15.40 t/ha). The percentage of seed yield for 65 (72%) and 75 (%) DAP was statistically identical, while the least was for 80 DAP (63%) (Table 2). Haulm cut at 80 DAP produced the maximum of 10.89 t/ha non-seed tuber, which was equivalent to 37%. The yield of non-seed tuber ranged from 5.90 t/ha at 65 DAP to 8.45 t/ha, which was corresponding to 28 to 30%, respectively. The best ration of seed and non-seed was 1:0.318 for 70 DAP and the poorest was 1:0.583 for 80 DAP (Table 2).

The tuber weight per hill increased with age, which is obvious upto 80 days under the tropical climatic condition of Bangladesh. Under this climatic conditions, potato crop mature within 85 to 95 days (Rashid, 1974; Ahmad 1977; Hussain, 1985). On weight basis, the maximum seed yield was recorded when haulm was cut at 70 days (19.75 t/ha), but statistically identical to 75 and 80 DAP. Beside, dehaulming at 75 and 80 days produced 19.56 and 18.69 t/ha, which indicates that with plant age, tuber size increased. As such, percentage of seed size tuber decreased. A decrease in the tuber yield with delayed planting has been reported by Lal and Sahota (1990) and Gupta (1990). Compared to 75 and

80 days, dehauling at 65 day scored 72% seed size tuber though its total tuber yield was lower than 75 and 80 days (Table 2).

Table 2. Effect of dates of haulm cutting on seed yield of potato during 1996-97 and 1997-98 (Pooled).

Days to haulm cutting	Tubers/hill	Wt of tubers/hill (g)	Yield (t/ha)	Seed yield (t/ha)	Percent seed tuber	Yield of non-seed tuber (t/ha)	Percent non-seed tuber	Ratio (seed: non-seed)
65	12.08	384.20	21.30	15.40	72.00	5.90	28.00	1: 0.383
70	15.06	469.20	26.02	19.75	76.00	6.28	24.00	1: 0.318
75	14.03	505.60	28.02	19.56	70.00	8.45	30.00	1: 0.432
80	12.31	533.00	29.57	18.69	63.00	10.89	37.00	1: 0.587
LSD (5%)	1.23	75.32	2.09	2.91	2.83	1.31	2.68	-

Effect of interaction of cultivar and haulm cutting on seed yield

In most of the cultivars, the number of tubers per hill for 65 and 80 DAP was the minimum and was almost similar (ranged from 10.50 to 13.46 for 65 DAP and 11.68 to 13.47 for 80 DAP). While, it ranged from 13.30 to 15.96 for 70 DAP and 12.02 to 16.11 for 80 DAP across the cultivars (Table 3). The weight of tubers per hill increased gradually in all the cultivars. The maximum was 598 g in Heera at 80 DAP and the minimum 350 g in Ailsa at the same duration. Similarly, tuber yield of the cultivars increased gradually from 65 DAP to 80 DAP. The cultivar Heera gave the maximum tuber yield (32.94 t/ha), which was closely followed by cv. Cardinal at 80 DAP (32.92 t/ha). The minimum yield of tuber was 19.46 t/ha in cv. Ailsa for 65 DAP. On weight basis, the cv. Cardinal gave the maximum seed yield (22.23 t/ha) at 80 DAP, closely followed by 22.12 t in cv. Heera at 70 DAP, the minimum was 13.49 t in cv. Dheera for 65 DAP (Table 3). On contrast, the percentage of seed yield ranged from 54.97 to 80.81. However, the cv. Dheera at 75 DAP gave the maximum percentage of seed yield (80.81), closely followed by the cv. Multa at 70 DAP (79.70%). For most of the cultivars, these percentage was the lowest at 65 DAP. The yield of non-seed tubers varied from 5.01 t/ha for cv. Dheera at 80 DAP to 14.94 t for Heera at the same duration (Table 3). The maximum percentage of non-seed was produced by cv. Heera at 80 DAP (45.03%) closely followed by the same cv. At 75 DAP (41.14%) and Ailsa at 80 DAP (39.74%), while the cv. Dheera at 75 DAP was the least (19.19%), which also gave the minimum ratio of seed to non-seed (1: 0.237). The h value of this ratio was 1:819 for cv. Heera at 80 DAP.

It is reported that under the tropical climatic condition, tuber weight of potato cultivars increases upto 80 days and decreases slowly after 90 days (Rashid, 1974; Ahmad, 1977; Hussain 1985). With the rise of temperature in the month of late February or March, potato storage food used in reverse order from tuber to

foliage (Beukema and Zaag, 1990). Garg *et al.* (1999) planted tubers on 15 April, 1 May, 1 June, and 20 June in India and haulms were cut after 75, 90, and 105 days. They recorded the maximum seed size tubers with early planting under long duration. They also recommended that late planting and short duration is also good. Akhter *et al.* (1998) studied bulking rate of potato cultivars and recorded 12.90, 18.92, 21.72, 27.68, and 30.11 tons tuber yield per ha after 50, 60, 70, 80, and 90 days, respectively. The bulking rate of crop grown from physiologically old seed was less than that of physiologically younger seed planted on earlier dates (Wurr, 1978). In the present investigation, seeds at right physiological age from 2nd generation tubers were used.

Table 3. Combined effect of variety and dates of haulm cutting on seed yield of potato crops during 1996-97 and 1997-98 (pooled).

Cultivars	Treatment		Tubers/hill	Wt. of tubers/hill (g)	Yield (t/ha)	Seed yield (t/ha)	Percent seed tuber	Yield of non-seed tuber (t/ha)	Percent non-seed tuber	Ratio (seed: non-seed)
	Days to haulm cutting									
Cardinal	65		13.46	405	22.39	15.69	70.08	6.70	29.92	0.427
	70		15.19	470	26.08	19.10	73.24	6.98	26.76	0.365
	75		16.11	495	27.47	18.48	67.27	8.99	32.73	0.486
	80		13.47	596	32.92	22.23	67.53	10.69	32.47	0.481
Mulla	65		13.69	374	20.79	15.60	75.04	5.19	24.96	0.333
	70		15.65	452	25.12	20.02	79.70	5.10	20.30	0.255
	75		12.02	477	26.35	18.49	70.17	7.86	29.83	0.425
	80		11.76	485	26.96	17.92	66.47	9.04	33.33	0.504
Heera	65		11.11	421	23.38	17.32	74.08	6.06	25.92	0.350
	70		15.96	520	28.66	22.12	77.18	6.54	22.82	0.296
	75		13.14	595	32.94	19.39	58.86	13.55	41.14	0.699
	80		11.68	598	33.18	18.24	54.97	14.94	45.03	0.819
Ailsa	65		10.50	350	19.46	14.89	76.52	4.57	23.48	0.307
	70		13.30	452	25.12	19.57	77.91	5.55	22.09	0.284
	75		15.63	492	27.22	20.36	74.80	6.86	25.20	0.337
	80		11.70	506	28.11	16.94	60.26	11.17	39.17	0.659
Dheera	65		11.66	371	20.49	13.49	65.84	7.00	34.16	0.519
	70		15.22	492	25.14	17.92	71.28	7.22	28.72	0.403
	75		13.27	469	26.11	21.10	80.81	5.01	19.19	0.237
	80		12.92	480	26.69	18.10	67.82	8.59	32.18	0.475
LSD (5%) for C x D			2.01	123.21	3.64	3.36	3.54	1.62	3.02	0.20

Conclusion

The results show that the crop should be allowed to grow 70 to 75 days for achieving the highest seed sized tuber yield as well as the number of seed tubers. Haulms can also be killed at 65 or 75 days without sacrificing much of number and seed sized tuber yield. It could expose the crop to a lesser period to diseases and pests which results in healthy seed crop.

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