*Available online at* www.agrifarming.org

DOI: http://dx.doi.org/10.18782/2582-7146.172

**ISSN: 2582 – 7146**

*Curr. Rese. Agri. Far.* (2022) *3*(3), 18-23

Current Research in Agriculture and Farming

*Research Article*

Peer-Reviewed, Refereed, Open Access Journal

# Standardization of Planting Time and Dehaulming on the Yield Potential and Quality in Potato in Reference to Tirap District of Arunachal Pradesh

**Abhimanyu Chaturvedi[1*], A.N. Tripathi[2], T.S. Mishra[3] and V.K. Pandey[4]**

[1]SMS (Horticulture), K.V.K. Tirap- Deomali, Arunachal Pradesh

[2]Senior Scientist & Head, KVK Tawang, Arunachal Pradesh

[3]SMS (Horticulture), K.V.K. West Kameng- Dirang, Arunachal Pradesh

[4]SMS (Horticulture), K.V.K. Lower Dibang Valley- Roing, Arunachal Pradesh

*Corresponding Author E-mail: manuhorti@gmail.com

Received: 13.04.2021 | Revised: 24.05.2022 | Accepted: 8.06.2022

**ABSTRACT**

*A field experiment was conducted to produce maximum tuber yield of potato by evaluating in relation to different planting times (31 October, 15 and 30 November) and dehaulming dates (80, 90 and 100 days after planting) during 2015-17 at the farm of Krishi Vigyan Kenda- Tirap, Arunachal Pradesh. The results confirmed that different growth parameters, e.g. plant height, leaves number per hill and foliage coverage were significantly influenced by planting times. Significantly higher yields were recorded on November 15, with all the dehaulming dates ranging from 20.67 to 21.50 t/ha.*

***Keywords:*** *Standardization, Potato, Sowing time, Dehaulming.*

## INTRODUCTION

The potato (*Solanum tuberosum* L.) is the staple food crop in the world (Braun, 2010). Potato tubers accumulate large amounts of starch and are low in fat, and their protein content is comparable to that of grains. In addition, potatoes contain vitamin C (Rodriguez- Falcon et al., 2006). Processing potatoes need some quality such as high dry matter, low, reducing sugar etc. It is reported that desirable processing attributes greatly varied with location (Kumar et al., 2003), time of sowing (Kumar et al., 2007), cultivars, time of dehaulming (Marwaha, 1998; & Marwaha et al., 2005) and revailing temperature during crop season (Pandey et al., 2008). Out of these, planting dates and haulm killing are important practices for cultivating and processing potatoes. Matured tubers are usually of high specific gravity, and this is closely connected with high yield and quality of chips. Moreover, mature potatoes are less susceptible to damage during transport, storage and reconditioning. The tuber's maturity is positively related to the planting dates and harvesting in particular regions, as well as weather conditions prevailing in a given year (Lisinka & Leszezynski, 1989).

**Cite this article:** Chaturvedi, A., Tripathi, A. N., Mishra, T. S., & Pandey, V. K. (2022). Standardization of Planting Time and Dehaulming on the Yield Potential and Quality in Potato in Reference to Tirap District of Arunachal Pradesh, *Curr. Rese. Agri. Far. 3*(3), 12-17. doi: http://dx.doi.org/10.18782/2582-7146.172

The optimum temperature for potato growth is 15–20ºC, with a lower limit of 5–10ºC and an upper limit of 25ºC (Haverkort, 1990; & Prange et al., 1990). Photoperiod & temperature during the growing season affect potatoes' sugar and dry matter content (Burton, 1989). Yamaguchi et al. (1964) reported that starch content, specific gravity and yield of tubers were the highest and sugar content lowest when tubers were grown in soil temperature between 15 and 24$^{o}$C, compared with tubers grown at higher temperatures. Interaction between planting date' and date of haulm killing maintained growth period, which ultimately affects yield, tuber size distribution and quality. However, the research on the suitable date of planting and dehaulming for good quality tuber yield has not been done in the eastern part of Arunachal Pradesh. In this situation, Krishi Vigyan Kendra – Tirap felt to standardize the planting time and crop growth duration to maximize tuber yield quality for potato growers.

## MATERIALS AND METHODS

A field trial was conducted at the farm of Krishi Vigya Kendra- Tirap during October 2016 – March 2017 & October 2017- March-2018. The farm's soil is well drained sandy loam having a pH of 5.8. The variety was Kufri Jyoti. The treatment consisted of 3 planting times of October 31 (D1), November 15 (D2) and November 30 (D3) along with 3 dehaulming dates of 80 (M1), 90 (M2), 100 (M3) days after planting (DAP). The treatments were arranged in a factorial randomized Complete Block Design with 3 replications. The unit plot size was 3.0 m × 3.0 m, and potato tubers were planted at a spacing of 60 cm × 25 cm. Two outer rows of plants were treated as border rows, while the three middle rows in each plot were regarded as experimental row plants. The land was fertilized with 40:60:30 kg/ha, respectively of NPK fertilizers in addition to 6 t/ha of cow dung (Hossain et al., 2007). The NPK fertilizers were applied in the forms of urea, triple super phosphate (TSP), muriate of potash (MoP), and gypsum. The total amount of cow dung, TSP, MoP, respectively and half of the urea was applied at furrow and mixed up with soil by a tine before planting seed tubers. The rest of the urea was applied as top dress 35 days after planting, followed by irrigation. The well pre-sprouted, healthy, whole seed tubers of around 40±5 g sized were planted as per treatment. All other intercultural operations were followed as per schedule. The plants, who were strait upward, were monitored, and the final emergence count was taken at 30 days after planting. Dehaulming was done manually as per treatment and potato tubers were harvested after 10 days of dehaulming. Data on growth parameters- like plant height, number of compound leaves per hill, stem per hill were taken at 60 DAP from randomly selected 10 plants per plot, and yield per hectare was calculated during harvest from the middle rows yield. Foliage coverage was recorded at 60 DAP by using green method (Groves et al., 2005). The data on growth, yield components and yield were statistically analyzed using the computer package programme of MSTAT-C and means were compared using Duncan's Multiple Range Test at 5% significance level.

## RESULTS AND DISCUSSION

### Growth attributes

The emergence of sprouts (92%) was recorded at 30 days after planting (DAP) and the emergence was not significantly affected by the date of planting, dehaulming schedule and their interaction (Table 1). This could be due to the same size of seed tubers planting. Besides, more or less favourable soil temperature and moisture conditions prevailed same in all the plots. As dehaulming schedule treatments were started after 80 days of planting, so obviously it did not affect plant emergence as well as other growth parameters like plant's height, no of compound leaves per hill, no of stem per hill and foliage coverage area (%). Plant height was significantly influenced by the date of planting. The result showed that plant height decreased as the

advancement of the date of planting. Thirty-first October planting (D 1) recorded the highest plant height (80.7 cm) as compared to D2 and D3 planting dates (Table 1). These differences in plant height might be due to weather conditions. The highest plant height in D1 planting can be attributed to the most favourable environment, i.e. the long period of high temperature for plant growth during the cropping season. The minimum height of the plant was recorded with D3; which could have lower temperature compared to other planting dates, thus lower temperature might have reduced allocation of assimilates for growth than the remaining two planting dates. The similar findings have also been reported by Sandhu et al. (2012), Singh and Khurana (1997) and Ezekiel and Bhargava (1992). The number of leaf per hill was significantly influenced by date of planting and was insignificant in dehaulming schedule and by the interaction between them (Table 1). The highest number of leaf per hill (67.1) was observed with D2 planting followed by D1 planting (63.5) and they could not differ significantly with each other. The lowest leaf number per hill (55.4) was recorded in D3 planting. This can be described due to the first two planting dates experienced more favourable environmental conditions, apparently longer period than D3 planting. The number of leaves per hill was ranging from 51.1 to 71.8 in the nine treatment combinations, but their differences were non-significant. Stem per hill was not significantly influenced by dates of planting and dehaulming and their interactions (Table 1). The stem per hill was ranged from 3.8 to 4.4 in the nine treatment combinations. This might be due to the similarity of the seed tuber's size. The foliage coverage was not significantly influenced by date of planting, dehaulming schedule and their interaction (Table 1). The maximum foliage coverage was recorded by the result of interaction between the date of planting & deahulming.

**Table: 1 Effect of planting dates and dehaulming on the growth of potato (average pooled data of 2016-17 & 2017-18)**

| Treatments | Plant emergence (%) | Plant height(cm) | Leaf /hill(no.) | Stem/hill(no.) | Foliage coverage (%) |
|---|---|---|---|---|---|
| A. Date of planting | | | | | |
| $D_1$ | 99.4 | 80.7a | 63.5a | 4.2 | 100.0a |
| $D_2$ | 99.6 | 69.1b | 67.1a | 4.2 | 100.0a |
| $D_3$ | 99.8 | 61.1c | 55.4b | 4.0 | 99.3b |
| B. Dehaulming schedule | | | | | |
| $M_1$ | 99.6 | 70.8 | 62.9 | 4.2 | 99.8 |
| $M_2$ | 99.4 | 69.4 | 62.0 | 4.3 | 99.7 |
| $M_3$ | 99.8 | 70.6 | 61.1 | 4.0 | 99.7 |
| Interaction between A & B | | | | | |
| $D_1M_1$ | 99.3 | 80.8 | 59.2 | 4.2 | 100.0 |
| $D_1M_2$ | 99.7 | 79.6 | 63.1 | 4.0 | 100.0 |
| $D_1M_3$ | 99.3 | 81.9 | 68.1 | 4.4 | 100.0 |
| $D_2M_1$ | 99.7 | 69.0 | 71.8 | 4.1 | 100.0 |
| $D_2M_2$ | 99.0 | 70.0 | 65.4 | 4.1 | 100.0 |
| $D_2M_3$ | 100.0 | 68.3 | 64.2 | 4.1 | 100.0 |
| $D_3M_1$ | 99.7 | 62.8 | 57.7 | 4.2 | 99.3 |
| $D_3M_2$ | 99.7 | 58.7 | 57.4 | 4.1 | 99.0 |
| $D_3M_3$ | 100.0 | 61.7 | 51.1 | 3.8 | 99.0 |
| CV (%) | 0.79 | 6.19 | 8.65 | 9.29 | 0.35 |
| SE (A×B) | 0.13 | 1.75 | 1.51 | 0.07 | 0.08 |

$D_1$ = 31 October, $D_2$ = 15 November & $D_3$ = 30 November, and $M_1$ = 80 days after planting (DAP), $M_2$ = 90 DAP, $D_3$ = 100 DAP

**Grades of tubers**

The maximum number of tuber per hill (4.1) was recorded with 31 October ($D_1$) planting date and it differed significantly with the other two planting dates (Table 2). The data shows that the tuber number per hill decreased significantly as the crop growth period was lengthened by delaying dehaulming (Table 2). The maximum number of tuber numbers per hill (3.7) was recorded at $M_1$ (dehaulming at 80 DAP) and the minimum (2.9) was observed at $M_3$ (dehaulming at 100 DAP). The similar results were reported by Kumar and Lal (2006). The combined effect of planting date and dehaulming schedule significantly influenced tuber number per hill (Table 2). The maximum number of tuber per hill (4.8) was recorded in $D_1M_1$, closely followed by $D_1M_2$ (4.6), but the differences were statistically similar. The minimum number of tuber per hill (2.7) was observed in $D_2M_3$ followed by $D_2M_2$ and $D_3M_2$. At dehaulming of 80 DAP, the crop period was comparatively short, resultant full bulking not completed. Consequently, the tuber number per hill was higher in $D_1M_1$ and $D_1M_2$ treatment combination.

The maximum weight of tuber per hill (97.5 g) was recorded at $D_1$ planting and the lowest (70.0 g) was observed at $D_2$ planting closely followed by $D_3$ planting (70.9 g) (Table 2). This might be due to lesser growth period was received by the $D_1$ planting for bulking compared to others that caused smaller size of tuber. The results showed that the increase the crop growth period, the decrease in tuber weight per hill significantly. The maximum weight of tuber weight per hill (90 g) was observed at $M_1$ dehaulming which was at par with $M_2$ (84.4 g). However, the minimum weight of tuber (64.0 g) was observed in $D_3$ planting. It might be due to lengthening the crop growth period, which facilitated more accumulation of photosynthates for tuber bulking resulted from more bigger sized tubers and neglegibleno of the non-processing grade tuber .The combined effect of planting and dehaulming significantly influenced the tuber weight per hill (Table 2). The maximum weight of the tuber per hill (114.4 g) was recorded in $D_1M_1$ which was also remained at par with $D_1M_2$ (111.1 g). Whereas the minimum (67.6 g) was observed in $D_3M_2$ followed by $D_3M_3$ (68.0 g), which were not significant.

**Table2. Effect of planting dates and dehaulming on yield components of potato (average pooled data of 2016-17 & 2017-18)**

| Treatments | Grades of tubers per hill (bynumber) | | | Grades of tubers per hill (by wt.(g)) | | |
|---|---|---|---|---|---|---|
| | <40 mm | ≥40 mm | Total | <40 mm | ≥40 mm | Total wt. |
| A. Date of planting | | | | | | |
| $D_1$ | 4.1 a | 4.0 b | 8.1 | 97.5 a | 242.6 c | 340.1 c |
| $D_2$ | 2.9 b | 4.9 a | 7.8 | 70.0 b | 327.3 a | 396.9 a |
| $D_3$ | 3.0 b | 4.8 a | 7.8 | 70.9 b | 292.7 b | 364.6 b |
| B. Dehaulming schedule | | | | | | |
| $M_1$ | 3.7 a | 4.2 b | 7.9 | 90.0 a | 272.7 c | 362.7 |
| $M_2$ | 3.4 b | 4.5 ab | 8.0 | 84.3 a | 286.9 b | 371.2 |
| $M_3$ | 2.9 c | 4.8 a | 7.6 | 63.9 b | 303.9 a | 367.8 |
| Interaction between A & B | | | | | | |
| $D_1M_1$ | 4.7 a | 3.6 b | 8.4 | 114.4 a | 207.8 f | 322.1 d |
| $D_1M_2$ | 4.6 a | 3.7 b | 8.3 | 111.1 a | 231.8 e | 342.9 c |
| $D_1M_3$ | 2.9 bc | 4.7 a | 7.6 | 67.1 bc | 288.3 d | 355.4 bc |
| $D_2M_1$ | 3.3 b | 4.6 a | 7.9 | 78.4 b | 317.6 bc | 396.0 a |
| $D_2M_2$ | 2.7 c | 5.0 a | 7.7 | 74.1 b | 326.7 ab | 400.8 a |
| $D_2M_3$ | 2.7 c | 5.0 a | 7.7 | 56.5 c | 337.5 a | 394.1 a |
| $D_3M_1$ | 3.1 bc | 4.7 a | 7.8 | 77.0 b | 292.9 d | 369.9 b |
| $D_3M_2$ | 2.9 bc | 5.0 a | 7.9 | 67.6 bc | 302.4 cd | 370.0 b |
| $D_3M_3$ | 3.0 bc | 4.7 a | 7.7 | 68.0 bc | 285.8 d | 353.8 bc |
| CV (%) | 6.85 | 7.60 | 4.74 | 7.99 | 3.17 | 2.45 |
| SE (A×B) | 0.15 | 0.1 | 0.08 | 1.13 | 1.09 | 1.54 |

$D_1$ = 31 October, $D_2$ = 15 November & $D_3$ = 30 November, and $M_1$ = 80 days after planting (DAP), $M_2$ = 90 DAP, $D_3$ = 100 DAP.

**Yield**

The yield of non-processing grade tubers has statistically differed with planting dates, dehaulming and their interaction (Table 2). The maximum yield of non-processing grade tuber (7.2 t/ha) was recorded in D1 planting, which was significantly better over the other two planting dates and it was around 32% of the total produce. Similarly, the higher yield of non- processing grade tuber (6.5 t/ha) was obtained with dehaulming at 80 DAP (M1), which was significantly higher than all other dehaulming dates, it was around 28%. These results corroborate the earlier findings of Singh and Kushwah (2010) where higher production of small size tubers obtained at earlier dehaulming may be due to lesser time available for bulking. The maximum yield of tuber (8.8 t/ha) was obtained in $D_1M_1$ followed by $D_1M_2$ (8.4 t/ha) and these were statistically similar and it was around 42% and 35% of the total yield, respectively. Whereas the lowest (3.8 t/ha) was observed in $D_2M_3$, around 26%. The data shows that at every planting date, the yield of non- processing grade tuber was decreased by the delayed of dehaulming except $D_3M_3$.

## CONCLUSION

Based on the results of the field trial, this can be concluded that farmers in the areas of eastern districts of Arunachal Pradesh, can grow potatoes following November 15 planting time plus dehaulming at 90 days after planting for achieving higher grade quality tuber yield.

**Acknowledgement:**

The authors are highly thankful to the Office of K.V.K. Tirap for their assistance and guidance during this trial.

**Funding:** NIL.

**Conflict of Interest:**

The author declares no conflict of interest.

**Author's contribution**

The trial was designed and conducted by the first author, data was analyzed by second author, result & discussion part were completed by third author and references collected by fourth author. Finally, all the writing work and correction done by first author.

## REFERENCES

Burton, W. G. (1989). Yield and content of dry matter: The underlying physiological processes. *In*: The Potato (W.G. Burton, Ed.). Longman Scientific and Technical, New York, USA. Pp. 84-155.

Ezekiel, E., & Bhargava, S. C. (1992). Physiological analysis of growth of potato in relation to planting date. *Indian J. Plant Physiol*. *35*(1), 56-63.

Groves, S, J., Wiltshire, A., B. & Cunnington, A. ( 2005). Managing maturity to improve crop processing quality and storage. Project Report, British Potato Council, London, p 48. Available at: http://www.potato.org.uk/sites/default/files/%5Bcurrent-page%3Aarg%3A%3F%5D/20055%20Managing%20Maturity%20236%20Final%2 0report.pdf (Accessed 12 December 2012).

Haverkort, A. J. ( 1990). Ecology of potato cropping systems in relation to latitude and altitude. *Agricultural Systems*. *32*, 251-272.

Kumar, D., Singh, S. V., & Pandey, S. K. (2003). Chemical maturity of potato processing cultivars grown in western Uttar Pradesh. *J. Indian Potato Assoc.* *30*(3-4), 225-32.

Kumar, D., Singh, S. V., Pandey, S. K., Singh, B. P., & Rawal, S. (2007). Effect of growing season on chipping quality of potatoes under sub-tropical climates. *Potato J. 34*(3-4),180-86.

Lisinka, G., & Leszezynski, W. (1989). *Potato Science and technology*. Elsevier Applied Science, England. 391 p.

Marwaha, R. S., Pandey, S. K., Singh, S. V., & Khurana, S. M. P. (2005). Processing and nutritional qualities of Indian and exotic potato cultivars as influenced

by harvest date, tuber curing, pre-storage holding period, storage and reconditioning under short Days. *Adv. Hort. Sci. 19*(3), 130-40.

Thuraj, R., & Ravichandran, G. (2014). Effect of date of planting on potato seed yield in the Indian southern hills. *Potato J. 41*(1), 91-93.

Pandey, S. K., Singh, D., Kumar, R. S., Marwaha, P., Manivel & Kumar, P. (2008). Performance of newly released Kufri Chipsona-3 Indian potato variety during different crop seasons in west-central plains. *Indian J. Agri. Sci. 78*(2), 116-21.

Prange, R. K., McRae, K. B., Midmore, D. J., & Deng, R. (1990). Reduction in potato growth at high temperature: role of photosynthesis and dark respiration. *Amer. Potato J. 67*, 357-369.

Rodríguez-Falcón, M., Bou, J., & Prat, S. (2006). Seasonal control of tuberization in potato. *Ann. Re. Plant Biol. 57*, 151–80.

Sandhu, K. S., Chinna, G. S., Marwaha, R. S., Pandey, S. K., Kumar, P., & Singh, R. K. (2012). Effect of staggered planting and dehaulming schedule on yield and processing quality of potato cultivars in Punjab. *Potato J. 39*(1), 39-47.

Singh, J., & Khurana, S. C. (1997). Effect of date of planting and gibberellic acid on potato seed crop. *Haryana J. Hort. Sci. 25*, 246-248.

Singh, S. P., & Kushwah, V. S. (2010). Effect of size of seed tubers and date of haulm cuttings on production of small seed tubers. *Potato J. 37*(3-4), 167-170.

Yamaguchi, M., Timm, H., & Spurr, A. R. (1964). Effects of soil temperature on growth and nutrition on potato plants and tuberization, composition and periderm structure of tuber. *Proc. Amer. Soc. Hort. Sci. 84*, 412-23.