# Influence of Plant Spacing and Seed Tuber Size on Yield and Quality of Potato (*Solanum tuberosum* L.) in Central Ethiopia

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## Abstract

Plant Cn[illegible]M

## Experimental treatments and design

T e treatments consisted of four tuber seed sizes in millimeter (mm) (25-34, 35-45, 46-55 and >56 mm) and f ve plants spacing (75 × 30 cm, 60 × 30 cm, 60 × 20 cm, 50 × 30 cm and 50 cm × 20 cm). T e experiment was laid out as a completely randomized block design (RCBD) in a factorial arrangement and replicated three times per treatment.

## Data collection and analysis

Data on yield, yield components and quality variables were collected and subjected to analysis of variance (ANOVA) using the General Linear Model of the SAS statistical package (SAS, 2007). All signi f cant pairs of treatment means were compared using the Least Signi f cant Di f erence Test (LSD) at 5% level of signi f cance.

# Results and Discussion

## Average tuber weight (g)

From the analysis of the variance, seed tuber sizes and plant spacing showed highly signi icant di f erence ($p<0.01$) on average tuber weight (Table 1). Highest average tuber weight (119.61 g) was recorded for plants grown from 35-45 mm seed tuber sizes and at 75 × 30 cm plant spacing treatment combinations this might be due to medium seed tuber sizes produced of optimum number of stems and wider plant spacing had less resource competitions they get high potential of resources whereas lowest average tuber weight (55.91 g) was obtained at 50 × 20 cm plant spacing and >56 mm seed tuber sizes treatment combinations. T e present result agreed with the inding of Berga et al.[4] that average tuber weight decreased with an increase in mother tuber size. Similarly, Zabihi-Mahmoodabad et al. [12] reported that increase in density probably causes the increase in competition between and within plants and hence, leads to decrease in availability of nutrients to each plant and consequently, results in decline of mean tuber weight. T e production of higher average tuber weight at wider plant spacing as compared to closer plant spacing was also reported by other authors [9,13,14].

| Tuber Size | Plant Spacing | | | | |
|---|---|---|---|---|---|
| | **75 × 30 cm** | **60 × 30 cm** | **60 × 20 cm** | **50 × 30 cm** | **50 × 20 cm** |
| >56 mm | 84.63c | 76.86cd | 66.69defg | 63.36fgh | 55.91h |
| 46-55 mm | 104.35b | 76.44cd | 71.09defg | 69.93defgh | 65.74efgh |
| 35-45 mm | 119.61a | 105.16b | 76.99cd | 72.92def | 66.99defg |
| 25-34 mm | 75.69cde | 74.57cde | 69.16efgh | 62.06gh | 63.75fgh |
| LSD/5% | 11.55 | | | | |
| CV/% | 9.03 | | | | |

Signi icantly maximum marketable yield (36.16 t $ha^{-1}$

and 25-34 mm seed tuber sizes by about 12.68 and 88.17%, respectively. Large seed tuber size (>56 mm) did not signifcantly diference with medium seed tuber size (46-55 mm) to produce high yield of medium tuber sizes (Table 2). When increased seed tuber size used for planting material from small to large seed tuber sizes the yield of medium seed tuber size also increased. T is result might be due to the presence of high number of eyes on large seed tubers than small seed tuber sizes consequently produced high yield of medium tuber sizes. Related study was reported by Khalafalla [18] that tuber number $m^2$ increased with increasing seed tuber weight.

**Tuber yield of small size (25-38 g):** he main factors of plant mm

: he%

tuber dry matter contents of more than 20% are acceptable. In this study, maximum and minimum tuber dry matter recorded were 23.92% and 23.47% respectively indicating that both plant spacing and seed tuber size did not signifcantly afected tuber dry matter content of potato. T e present result is in harmony with the fndings of Tesfaye who confrmed that plant spacing did not signifcantly afected tuber dry matter content of potato.

| Spacing | Parameter | | |
|---|---|---|---|
| | SG | TDM | Starch yield t ha$^{-1}$ |
| 75 cm × 30 cm | 1.13 | 23.65 | 7.02 |
| 60 cm × 30 cm | 1.12 | 23.49 | 7.88 |
| 60 cm × 20 cm | 1.12 | 23.59 | 7.21 |
| 50 cm × 30 cm | 1.12 | 23.92 | 7.55 |
| 50 cm × 20 cm | 1.11 | 23.79 | 7.02 |
| LSD/5% | ns | ns | ns |
| Tuber Size | | | |
| >56 mm | 1.11 | 23.47 | 8.07a |
| 45-55 mm | 1.12 | 23.82 | 8.087a |
| 35-45 mm | 1.12 | 23.78 | 7.73a |
| 25-34 mm | 1.12 | 23.68 | 5.45b |
| LSD/5% | ns | ns | 0.95 |
| CV/% | 1.73 | 5.84 | 17.55 |

**Table 4:** Specifc gravity, dry matter content, tubers sphericity, and total starch yield per hectare as infuenced by plant spacing and seed tuber size. Means followed by the same letter (s) within a column are not signifcant diferent at 5% level of signifcance. LSD=least signifcant diference, CV=coefcient of vitiation.

## Summary and Conclusion

In conclusion, the result of this study have revealed that plant spacing of 60 cm × 30 cm, 60 cm × 20 cm and 50 cm × 20 cm resulted in the production of higher marketable tuber yields than the other spacing. However, the amount of seed to cover a given area has to be considered the spacing of 60 × 30 cm plant more appropriate than the other two spacing for tuber yield production. Similarly, large (>56 mm) seed tuber sizes produced maximum marketable tuber yields than small and medium (35-45 mm) seed tuber sizes but medium tuber seed sizes (35-45 mm) were appropriate for tuber yield production by considering the seed tuber costs.

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