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Research Article

Tuber Yield and Quality of Potato (*Solanum tuberosum*) Varieties Influenced by Flower Bud Management and Seed Tuber Size

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Abstract

The study conducted in the Horo District (Gitilo) from May 2014 to September 2015 aimed to evaluate the impact of seed tuber sizes and flower bud management on the yield and quality of five potato cultivars: Jalenie, Guduru, Horo, Menagesha, and Gudenie. The tuber sizes were categorized into five groups and two approaches were implemented: removal of buds prior to flower initiation and cultivation without bud removal. The experimental design was split-split plot, with three replications. Significant interactions were observed among plant height, the number of main stems per plant, average tuber weight, and tuber size, as well as overall yield and tuber size. Dry matter content and tuber specific gravity were also influenced by the variety of tuber sizes and flower bud management. The Gudenie variety, grown with flower bud removal, achieved a tuber size of 66-80g and the tallest plant height at 80.38 cm. The Gudenie variety with flower bud removal had the highest overall tuber yield (24.81 tons/ha) and a higher dry matter content of 19.98%. To formulate a robust recommendation, the study should be replicated across various locations and seasons, incorporating additional varieties, processing quality assessments, and other agronomic practices related to the crop.

Keywords: Flower bud; Interaction effect; Seed size; Tuber yield; Tuber Quality

Introduction

Potato, a crucial tuber and vegetable crop, ranks fourth among the most important food crops globally after maize, wheat, and rice. In Ethiopia, potato production is high due to its high yield potential per hectare and nutritious tubers [1]. The country has suitable climatic and edaphic conditions for high-quality potato production [2]. However, the potato yield is low due to biotic and abiotic factors such as poor seed tuber size, plant density, lack of improved crop variety, high-quality seed potatoes, late blight, and inadequate pest management practices [3-5].

Seed tuber size and intra-row spacing are major factors affecting potato production and productivity [6,7]. In Ethiopia, the amount of seed tuber used per ha is quite bulky, resulting in ware potato wastage [8-10]. Optimal seed tuber size and intra-row spacing can reduce the potato seed rate to less than 40%. Larger seed tuber sizes have higher yield performance and quality.

Prudent removal of vegetative buds and younger leaves can modify phyto-hormone levels in the plant, leading to increased tuber weight per plant and decreased haulm weight per plant [11,12]. The performance of seeds is related to size uniformity and optimum intra-row spacing to increase yields and ensure uniform planting [13,14]. Small size seeds are a major problem in Ethiopia.

Potato tuber size and different intra-row spacing were suggested for producing good quality potato tubers in different parts of Ethiopia [10]. Seed tuber size of 45-55mm diameter (90g) was suggested for ware potato production at Adet Agricultural Research Center and [15] and Harn *et al.* [16].

Potato productivity in the area is below the regional and national average due to variations in seed size, intra-row spacing, and agronomic practices. Growers use bulk seed tubers, resulting in nonunion form [17,18]. The Bako Agricultural Research Center (JARC) introduced Jalenie and Gudenie varieties to the farmer's field, but growers still use variable seed tuber sizes due to the lack of recommended tuber size. Investigating flower bud management and tuber size is crucial to identify the effects of seed tuber size and flower bud effect on potato yield and quality. The removal of potato flowers has a significant impact on tuber yield and quality, as flowers and tubers compete for assimilates. Pruning flowers or berries increases transferred assimilates into underground structures, increasing tuber yield.

Therefore, the study aimed to evaluate the impact of seed tuber size and flower bud management on potato yield and quality.

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Table 1: Description of varieties [19].

Variety name	Ecological requirements		Yield (t/hac.)		Year of release	Maintainer	Maturity day
	Altitude(m)	Rainfall(mm)	RM	FM			
Jaline	1600-2800	750-1000	44.8	29.1	2002	HARC	90-120
Gudeine	1600-2800	750-1000	29.2	21	2006	HARC	120
Guduru	1550-2800	>1000	28.5	20	2008	BARC	100-120
Horo	1600-2800	>800	28.8	22	2007	BARC	110-130
Menagesha	2000-2900	>7500	27	21	1993	HARC	110-130

RM= Research Field Management, FM= Farmers Field Management.

Materials and Methods

The Study Site

The experiment was conducted in Horo District, Gitilo, Wollega University Research site, Western Ethiopia from 2020 to 2021, under rain-fed conditions. The site, located 10km from Shambu town and 352km west of Addis Ababa city, experienced unimodal rainfall between 1800-2000mm, with 70% falling in July and August. The soil was fine-textured heavy loamy clay with a pH of 6.0, with annual minimum and maximum temperatures of 13 and 21°C.

Experimental Materials

Five potato varieties (Jalenie, Horo, Guduru, Menagesha and Gudenie) were used for this study (Table 1). The potato seed tubers were obtained from Holleta Agricultural Research Center. The varieties were selected due to their adaptability to the study area.

Experimental Treatment and Design

The study focused on two flower bud management methods and seed tuber treatments. Seed tubers were weighed and categorized into five weight ranges. The experiment was divided into main plots and sub-sub plots, with the two flower bud management methods assigned to the main plots and the five varieties and tuber sizes assigned to the sub-sub plots. The experiment was conducted in a split-split plot design with three replications.

Land Preparation and Management

The plots were divided into three rows, with 10 plants per row, and 40 plants per plot. Following the national recommendation, 165kg/ha UREA and 195kg/ha NPS were applied. Fertilizer was applied twice, first on planting date, with one-third of NPS and one-third of UREA, and then on the first weeding after three weeks.

Data Collection

The study involved collecting data from four rows of plants, with data collected from two middle rows consisting of eight plants per row. The main stems were counted during the tuber initiation stage, and plant height was measured from 16 plants of the middle row. The tuber number per plant was taken at harvest, and the average tuber weight was calculated by dividing the total fresh weight of tubers per plot by the total number of tubers at harvest [19,20]. Marketable tuber yield was calculated on a hectare basis for healthy tubers with a size greater than 20 g, while unmarketable yield was calculated for rotten, diseased, insect damage, deformed tubers, and tubers with a weight smaller than 20 g [21]. The total tuber yield was recorded by adding both marketable and unmarketable yields per plot and then converted to hectare. Tuber specific gravity was estimated using the tuber weight in air and water methods.

$$\text{Tuber Specific Gravity (g/cm3)} = = \frac{\text{weight of tuber in air}}{\text{fweight in air} - \text{weight in water}} \text{ …. (1)}$$

Dry Matter Content (%): Tubers were randomly selected per plot and washed, chopped, and mixed, and then, about 200 g of sample was taken and pre dry at a temperature of 60°C for 15hrs and further dried for 3hrs at 105°C in a drying oven. Finally, the amount was calculated by using the formula below.

$$\text{Dry matter content (\%)} = = \frac{\text{dry weight}}{\text{fresh weight}} \times 100 \text{……. (2)}$$

Data Analysis: Data were checked for all ANOVA assumptions. Analysis of variance (ANOVA) was done using SAS version 9.2 statistical software [22]. Mean separations were done using Tukey's test at 5% probability level.

Results and Discussion

Growth Parameters

Plant Height: The study found that plant height significantly influences the interaction of flower bud management, variety, and tuber size. Menagesha variety had the highest plant height and tuber size when grown without removing the flower bud before emerging. Similar results were obtained from Gudenie with tuber size 66-80g grown without removing the flower bud before emerging, and the shortest plant height (46.06cm) from Gudenie with tuber size 35-50g grown with flower bud removal. Plant height was greater in the treatment combination of Menagesha than in other varieties.

Maximum plant height was obtained without removing the flower bud from Menagesha, indicating that there may be height increment after flower bud initiation and a difference in varietal responses [11,18] However, the current study found that the combination of large seed tuber size gave the maximum plant height, consistent with Islam et al.'s [23,24] findings that large seed tuber sizes have more food reserve to supply adequate nutrients to the plant and enhance plant height.

The difference in varietal responses and bud initiation was also observed. The current study indicates that the combination of large seed tuber size gives the maximum plant height, which is consistent with Islam et al.'s findings Masarirambi et al. [7].

Number of Main Stems per Plant: The study found that the number of main stems per plant was significantly influenced by three factors: flower bud management, variety, and tuber size. The highest number of main stems was obtained from variety Guduru with a tuber size of 81-95g grown without removing the flower bud, followed by Menagesha with a tuber size of 66-80g grown under the same flower bud management conditions. The combination of flower bud removal and larger seed tuber sizes resulted in a greater number of main stems. The higher number of main stems produced per plant by the treatment combination from variety Guduru was likely due

Table 2: Interaction effects of Flower bud management, variety and tuber size on growth parameters of potato in 2014/2015 at Gitilo.

Treatment			Growth parameters	
	Varieties	Seed size(g)	No of main stem	Plant height(cm)
		20–35	2.20^{uv}	43.70^{no}
	Jalenie	36–50	2.70st	47.43^{t}
Flower bud Management		51–65	4.84^{mn}	48.90^{tu}
		66–80	6.02g^{hij}	57.04^{p-s}
		81–95	6.40^{g}	63.79^{jkl}
		20–35	2.31^{tuv}	65.35^{g-k}
	Horo	36–50	3.33^{pq}	54.02^{n-s}
		51–65	4.79^{mn}	58.48^{n-q}
		66–80	8.38^{c}	74.08^{bc}
		81–95	8.19^{c}	63.44^{jkl}
		20–35	2.73^{rst}	48.06^{tu}
	Gudenie	36–50	3.29^{q}	46.06^{t}
		51–65	5.08^{lm}	61.81^{k-n}
		66–80	7.52^{ef}	70.48^{b-f}
		81–95	8.09^{cd}	65.08^{h-l}
		20–35	3.23^{q}	54.63^{qrs}
	Menagesha	36–50	3.52^{pq}	46.54^{t}
		51–65	5.46^{kl}	57.75^{o-r}
Flower bud removed		66–80	8.35^{c}	65.04^{h-l}
		81–95	9.10^{b}	58.40^{n-q}
		20–35	3.25^{q}	46.67^{t}
	Guduru	36–50	4.11^{o}	48.21^{tu}
		51–65	6.19^{gh}	56.31^{p-s}
		66–80	9.10^{cd}	65.02^{h-l}
		81–95	9.79^{a}	56.94^{pqr}
		20–35	2.27^{tuv}	56.73^{p-s}
		36–50	3.33^{pq}	64.27^{h-l}
	Jalenie	51–65	3.42^{pq}	67.33^{e-j}
		66–80	5.00^{lm}n	74.40^{b}
		81–95	4.60^{n}	71.83^{bcd}
		20–35	2.27^{tuv}	59.02^{m-p}
	Horo	36–50	3.50^{pq}	64.65^{h-l}
		51–65	3.79^{op}	64.13^{i-l}
		66–80	6.17^{ghi}	71.21^{b-e}
		81–95	5.69^{jk}	79.75^{ab}
		20–35	2.64^{stu}	53.56^{s}
		36–50	3.29^{q}	69.25^{d-g}
	Gudenie	51–65	5.65^{jk}	68.23^{d-h}
		66–80	7.40^{ef}	67.98$^{d-l,}$
Flower bud not removed		81–95	6.10^{ghij}	70.44^{b-f}
		20–35	2.17^{v}	66.69^{fg}
	Menagesha	36–50	3.17^{qr}	65.21^{h-k}
		51–65	5.44^{kl}	79.09^{a}
		66–80	7.15^{f}	80.38^{a}
		81–95	5.75^{hijk}	76.30^{b}
		20–35	2.42^{tuv}	62.54^{klm}
	Guduru	36–50	3.11^{qrs}	61.17^{l-o}
		51–65	5.71^{ijk}	62.63^{klm}
		66–80	7.67^{de}	70.31^{c-f}
		81–95	6.06^{ghi}	70.19^{c}
SEM			0.17	1.47
CV (%)			5.95	4.17
LSD (5%)			0.47	4.13

Means with the same letter (s) within a column of a variable were not significantly different at $p < 0.05$. SEM = standard error mean, CV = coefficient of variation, and LSD = least significance difference.

to its genetic potential for sprouting capacity. Seed factors, such as seed size, are the most influential because they influence the number of main stems that can emerge from a seed tuber [25]. Variations in tuber size between treatments could be attributed to differences in the number of main stems per plant [26]. Previous studies have suggested that variations in the number of buds per tuber, which is influenced by tuber size, could also influence the number of main stems per plant (Table 2).

Yield Parameters

Tuber Number per Plant: The study found a significant three-way interaction effect of flower bud management, variety, and tuber size on tuber number per plant. The highest tuber number per plant was obtained from Jalenie with a tuber size of 66-80 g, followed by Jalenie with a tuber size of 81-95 g and not removing inflorescences before initiation. The lowest tuber number was obtained from both flower bud removed and unremoved varieties, as well as from variety Menagesha with a tuber size of 20-35 g in both flower bud treatments.

Treatment combinations from all varieties gave different results of tuber number per plant due to varietal differences in producing the tubers. Large tubers produced more tubers than smaller ones, possibly due to the potential for high sprouts. Flower bud removal had no significant influence on tuber number per plant, possibly because it cannot influence the genetic potential of the crop. The physiological activities of tuberization started before flower bud commencement [27].

The variation in the total number of tubers among treated plants were not significant, as flowers and tubers of potato compete to attract assimilates, and pruning of flowers would increase assimilate transition to underground structures to increase tuber yield. Large seed tubers produced more tubers per plant significantly over small seed tubers [24]. Tuber number per plant and per hectare consistently increased with increasing seed tuber size, similar to findings of Gulluoglu and Arioglu. [27] also reported that variety Jalenie scored the maximum tuber number per plant, while variety Gudenie scored the lowest, possibly due to variety difference.

Average Tuber Weight: The study found that the average tuber weight of potatoes was significantly influenced by three factors: flower bud management, variety, and tuber size. The highest average tuber weight was obtained by removing flower buds before initiation from variety Gudenie, which had a tuber size of 66-80 g. The lowest average tuber weight was obtained by not removing flower buds and variety Horo, which had a tuber size of 51-65 g. The study suggests that removing flower buds and increasing tuber size increases the average tuber weight of potatoes, as photo assimilates can be taken up primarily by larger tubers. This finding aligns with previous research that found that the amount of assimilates in plants is determined by the organ's sink strength, indicating that large seed tuber size can provide sufficient substances for growth and development during the initial growth phase [23].

Marketable Tuber Yield: The study found that the three-way interaction of flower bud management, variety, and tuber size significantly influenced the average tuber weight and marketable tuber yield. The maximum marketable tuber yield was obtained by removing flower buds and using the variety Gudenie with tubers weighing 66-80 g, which is statistically equivalent to the same variety grown by flower bud removal (19.48 t/ha) with tuber size of 81-95 g. This may be due to the absence of competition for a limiting factor between developing flowers and tubers. The majority of initiated tubers in this study grew to marketable size. The lowest marketable tuber yield (8.23 t/ha) was obtained when flower bud pruning was not used and from the variety Gudenie with tuber sizes ranging from 20 to 35 g. Large seed tuber sizes resulted in higher marketable tuber yields, and large seed tubers can withstand the effects of competition due to their high performance in providing stored food during the early growth phase and removing sinkers [18].

These results are in agreement with [29] finding that large seed tubers have more food reserves to supply sufficient nutrients to the plant and enhance the production of marketable tuber yield. The difference among varieties was also observed, with the Gudenie variety resulting in higher marketable tuber yield than other varieties [27].

Unmarketable Tuber Yield: The study found that the three-way interaction of flower bud management, variety, and tuber size significantly influenced unmarketable tuber yield. The two-way interactions of variety by flower bud management, variety by tuber size, and flower bud management by tuber size also had an impact on unmarketable tuber yield. The Jalenie variety produced the highest unmarketable tuber yield (7.52 t/ha) with tubers weighing 81-95 g without the flower bud removed. The Guduru variety produced the smallest (2.46 t/ha) unmarketable tuber yield (2.46 t/ha).

The production of tuber yield depends on the performance of seed tubers at planting, so smaller seed tubers and the same size yield can be expected. Large seed tubers without flower bud pruning resulted in a higher unmarketable tuber yield, which is similar to the work of Gebregwergis et al., who reported that planting large seed tubers at closer intra-row spacing resulted in lower tuber yield due to increased intra-plant and plant organ competition. When smaller seed tubers were used for planting, they produced a greater number of smaller tubers, which became unmarketable tubers [27]. This suggests that the production of tuber yield is dependent on the performance of seed tubers at planting. Therefore, smaller seed tubers and the same size yield can be expected [28,29].

Total Tuber Yield: The study found that the total tuber yields significantly influenced by flower bud management, variety, and tuber size. The highest total tuber yield was recorded in variety Gudenie, which had a tuber size of 66-80 g, followed by variety Jalenie, which had a tuber size of 81-95 g. The lowest total tuber yield was obtained in variety Menagesha, which had a tuber size of 20-35 g. The study suggests that flower bud management can lead to the growth of late tuberized and small tubers per plant, resulting in high yields. However, when sinkers compete heavily, many small tubers may not be visible or counted in small tuber groups. This could be due to the appropriate timing of flower removal and earthing up, which increases the number of tubers. The study also revealed varietal differences in the production of total tuber yield, with Gudenie producing the highest total tuber yield [30]. Patel et al. [31] found that Jalenie had significantly higher total potato tuber yield than Gudenie. Patel et al. found that larger tubers weighing 51-70 g resulted in higher tuber yield, possibly due to faster seedling emergence and better plant growth [32] (Table 3).

Table 3: Interaction effects of variety, intra-row spacing, and tuber size on yield parameters of potato in 2014/2015 at Gitilo.

Treatment			Yield parameters				
Flower bud Management	Varieties	Seed size(g)	MTY (t/ha)	UMTY (t/ha)	TTY (t/ha)	TN	ATW (g)
Flower bud removed	Jalenie	20–35	10.64^{i-l}	5.01^{ghi}	16.65^{l-r}	6.46^{i-q}	47.51vwx
		36–50	16.55^{b-f}	7.24^{abc}	23.80^{abc}	6.31^{k-r}	49.45^{r-u}
		51–65	16.58^{b-f}	7.46^{ab}	24.05^{abc}	8.05^{abc}	64.05^{abc}
		66–80	17.04^{a-d}	6.49^{cd}	23.52^{a-d}	7.64^{b-f}	56.72$_{efg}$
		81–95	16.76^{b-f}	7.52^{a}	24.38^{ab}	8.32^{ab}	56.03^{f-i}
	Horo	20–35	14.66^{c-h}	6.43^{cde}	21.09^{a-j}	7.38^{c-h}	55.20^{g-k}
		36–50	11.14$^{g -i}$	6.29^{cdef}	23.40^{a-d}	7.18^{e-k}	56.59^{fgh}
		51–65	17.12^{a-f}	4.76^{f-l}	19.9^{d-m}	6.63^{g-o}	55.74^{g-j}
		66–80	13.77^{c-j}	4.91^{f-k}	24.84^{a}	6.84^{h-j}	54.84^{i-l}
		81–95	14.59^{c-i}	5.06^{ghi}	24.54^{ab}	8.21^{abc}	50.82^{o-s}
	Gudenie	20–35	14.77^{c-f}	3.49^{m-s}	18.08^{h-q}	6.91^{e-m}	51.13o-r
		36–50	15.59^{c-f}	3.51^{m-s}	19.22e-o	7.35^{c-i}	56.80^{efg}
		51–65	15.83^{c-f}	3.63^{m-s}	19.39^{e-n}	6.83^{f-n}	57.76^{de}
		66–80	19.93^{a}	4.88^{f-l}	24.81^{a}	7.53^{b-g}	66.05^{a}
		81–95	19.48^{ab}	4.22^{f-l}	23.82^{a-d}	7.16^{e-k}	54.22^{jkl}
	Menagesha	20–35	13.39^{d-j}	3.51^{m-s}	16.90^{l-r}	4.30^{vw}	52.13^{m-o}
		36–50	17.41^{a-f}	3.63^{m-s}	21.95^{a-g}	6.95^{e-l}	53.03^{l-o}
		51–65	18.32^{a-d}	3.88^{q-v}	20.28^{c-l}	7.38^{c-h}	54.59^{i-l}
		66–80	19.43^{ab}	4.22^{i-o}	24.15^{ab}	7.80^{a-e}	56.17^{f-i}
		81–95	14.88^{c-h}	3.82^{r-v}	17.69i-r	7.24^{d-j}	58.99^{d}
	Guduru	20–35	10.08^{e-k}	4.44^{h-n}	22.35^{a-f}	5.87^{o-t}	48.76^{tuv}
		36–50	13.50^{c-j}	2.46^{h-m}	15.54^{o-r}	6.30^{k-r}	49.92^{p-t}
		51–65	13.74^{c-j}	2.70^{s-v}	16.19^{m-r}	6.24^{k-r}	50.15^{p-t}
		66–80	17.91^{a-e}	3.97^{k-p}	22.55^{a-e}	8.23^{abc}	50.74^{o-s}
		81–95	18.58^{abc}	2.82^{r-v}	21.40^{a-i}	6.81^{f-n}	51.24^{opq}
Flower bud not removed	Jalenie	20–35	12.58^{f-k}	5.60^{c-g}	15.90^{p-r}	5.37^{o-t}	43.7^{z}
		36–50	12.39^{f-k}	5.42^{fgh}	17.81^{i-r}	6.17^{l-r}	43.73^{z}
		51–65	12.88^{e-k}	5.19^{gh}	18.07^{h-q}	5.84^{o-t}	43.75^{z}
		66–80	12.17^{f-k}	4.38^{h-n}	16.55^{l-r}	6.43^{j-q}	43.81^{z}
		81–95	16.98^{b-f}	4.33^{h-o}	15.31^{pqr}	8.33^{ab}	44.77^{yz}
	Horo	20–35	10.23^{kl}	4.97^{f-j}	15.20^{pqr}	5.43^{r-u}	43.73^{z}
		36–50	11.68^{h-l}	4.38^{h-n}	16.06^{n-r}	5.18^{s-v}	43.71^{z}
		51–65	12.00^{f-k}	5.41^{efg}	17.41^{j-r}	6.48^{h}	43.52^{z}
		66–80	14.63^{c-h}	4.18^{i-o}	18.81^{e-p}	8.16^{a-d}	43.71^{z}
		81–95	16.44^{b-f}	4.36^{h-n}	20.80^{n-s}	5.71^{p-u}	44.58^{y}
	Gudenie	20–35	14.10^{c-h}	4.41^{h-n}	15.51^{o-r}	6.14^{l-r}	47.73^{uvw}
		36–50	15.41^{c-i}	4.24^{h-o}	16.65l^{-r}	7.17^{e-k}	50.85^{o-s}
		51–65	15.08^{c-g}	3.56^{m-s}	18.64^{f-q}	7.76^{a-e}	52.00^{mno}
		66–80	15.13^{c-g}	2.86^{q-v}	17.99^{i-q}	6.63^{g-o}	54.92^{h-k}
		81–95	12.88^{e-k}	3.81^{k-q}	16.69^{l-r}	6.61^{h-p}	62.94^{b}
	Menagesha	20–35	11.81^{h-k}	4.61^{h-m}	14.72^{q-r}	4.30^{v-w}	45.90^{xy}
		36–50	12.12^{f-k}	4.01^{j-p}	16.14^{m-r}	5.68^{q-u}	49.15^{s-v}
		51–65	12.30^{f-k}	3.76^{m-r}	16.06^{n-r}	5.23^{s-v}	49.52^{q-t}
		66–80	14.79^{c-h}	3.55^{m-s}	18.34^{g-q}	7.60^{b-f}	58.46^{de}
		81–95	11.78^{h-l}	3.15^{p-u}	16.72^{qr}	5.77^{o-t}	60.83^{c}
	Guduru	20–35	8.23^{l-m}	3.64^{m-s}	15.87^{n-r}	4.3^{uv}	46.71^{wx}
		36–50	10.39^{i-k}	3.51^{m-s}	15.90^{n-r}	5.03^{tuv}	49.61^{q-t}
		51–65	13.76^{c-j}	3.39^{o-u}	17.15^{k-r}	6.00^{n-s}	51.42^{no}
		66–80	15.72^{c-f}	3.73^{o-t}	18.49^{g-q}	6.49^{h-q}	51.61^{mnop}
		81–95	14.70^{c-h}	3.47^{n-s}	18.17^{h-q}	6.50^{h-q}	52.19^{mno}
SEM			1.12	0.34	1.35	0.33	0.63
CV (%)			13.2	13.7	12.2	8.5	2.2
LSD (5%)			3.15	0.96	3.78	0.9	1.7

Means with the same letter (s) in a column of a variable were not significantly different at *p<0.05.* MTY = marketable tuber yield, UMTY =unmarketable tuber yield, TTY = total tuber yield, TN = tuber number per plant, ATW = average tuber weight, SEM = standard error mean, CV = coefficient of variation, and LSD = least significance difference.

Table 4: Interaction effect of flower bud management and variety on quality parameters of potato in 2014/2015 at Gitilo.

Treatment		Parameters	
Flower bud management	varieties	Dry matter content (%)	Tuber specific gravity (g/cm3)
Flower bud removed	Jalenie	19.96_a	1.074^{ab}
	Gudenie	19.98^{a}	1.079^{a}
	Horo	18.77^{bc}	1.065^{d}
	Guduru	17.03^{e}	1.061^{ef}
	Menagesha	17.35^{e}	1.064^{de}
Flower bud not removed	Jalenie	18.08^{d}	1.063^{de}
	Gudenie	19.05^{b}	1.068^{c}
	Horo	17.03^{e}	1.073^{b}
	Guduru	17.35^{e}	1.06^{1f}
	Menagesha	17.01^{de}	1.059^{ef}
SEM		0.2	0.001
CV (%		4.6	0.4
LSD(5%		0.6	0.003

Means with the same letter (s) in a column of a variable were not significantly different at $p < 0.05$. SEM = standard error mean, CV =coefficient of variation, and LSD = least significance difference.

Quality Parameters

Dry Matter Content: The study found that the dry matter content of potato tubers was significantly affected by the two-way interaction of variety with flower bud management. The three-way interaction of flower bud management by tuber size and varieties had no significant effect on tuber dry matter content. The highest dry matter content was observed in variety Gudenie, which was grown with flower bud removal (19.98%), while the lowest was recorded from variety Menagesha grown without flower bud removal (17.03%). Late maturing potato varieties had high dry matter content, as the growing period of potato increased, resulting in increased tuber dry matter [33,34]. The dry matter content was affected differently for different varieties, with higher dry matter content observed in variety Gudenie than Jalenie. The increase in tuber dry matter content may be due to the largest proportion of assimilates being diverted to developing tubers rather than flower production, resulting in more carbohydrate accumulation in the tubers as dry matter [34]. The results support previous observations [35] that removing flowers significantly increased tuber dry matter content in potato.

Tuber Specific Gravity (g/cm3): The study found that flower bud management and variety significantly affect specific gravity in potato plants. The maximum value of tuber specific gravity was obtained from Gudenie, followed by Jalenie and Menagesha. The highest value was obtained by removing flower buds at initiation, while the lowest was obtained without removing buds. Shayanowako et al. [30] suggests that tuber specific gravity may vary among varieties due to genetic variability. The study also found that potato varieties with high specific gravity were acceptable for processing purposes like chips. The findings suggest that the specific gravity of tubers may be higher at intermediate stem numbers [23] (Table 4).

Conclusions

Bud management with tuber seed size showed important variability. The study concluded that the interaction effects of flower bud management, variety, and tuber size significantly influenced potato yield in Horo district Gitilo area. The study needs more investigation in multi-locations with more seasons, varieties, quality, and other agronomic traits to reach a conclusive recommendation.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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