



## **EFFECTS OF CURED MUNICIPAL WASTE, SEASON AND VARIETY ON THE GROWTH AND YIELD OF POTATO (*Solanum tuberosum* L.)**

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### **ABSTRACT**

A Field experiment was conducted at Kweredu, Mangu LGA, Plateau State, during 2023 wet and dry season to determine the effect of cured municipal waste and variety on the growth and yield of potato (*Solanum tuberosum* L.). The treatments consisted of five cured municipal waste levels (0.0kg, 3.0kg, 6.0kg, 9.0kg and 12.0kg) and two varieties of potato (Nicola and Marabel), these were factorially combined and laid out in a randomized complete block design (RCBD) with four replications. The results of the experiment revealed a significant ( $P \leq 0.05$ ) difference among the treatments used throughout the study period. The result further indicated that growing potatoes during the wet season was found to be significantly ( $P \leq 0.05$ ) better than the dry season in most of the characters studied. Variety on the other hand, the result showed that Nicola was proved to be statistically ( $P \leq 0.05$ ) better than Marabel in most of the characters studied irrespective of the season. The result also showed that application of 12.0 t/ha of cured municipal waste produced significantly ( $P \leq 0.05$ ) better than the other rates considered in all the characters observed irrespective of the variety and season of the study. The result of interaction revealed that growing Nicola variety during wet season with the application of 12.0 t/ha of cured municipal waste produced significantly ( $P \leq 0.05$ ) better than all the treatments combined in most of the characters observed throughout the study period. In conclusion however, season, variety and municipal had significant ( $P \leq 0.05$ ) effects on the growth and yield of potato. Based on the result of this study, application of cured municipal waste at the rate of 12.0 t/ha to Nicola variety irrespective of the season should be adopted by farmers in the study area for higher yield of potato.

**Keywords:** Potato, Variety, Cured municipal waste

### **INTRODUCTION**

Potato (*Solanum tuberosum* L.) belongs to the *solanaceae* (nightshade) family of flowering plants (CIP, 2010). It is the world's fourth-largest food crop, following rice, wheat and maize (FAO, 2008; Tantowijoyo and Fliert, 2006). While it is a staple food in some countries, in others it is used as a vegetable (Mahmod, 2005; Zamil *et al.*, 2010). Potatoes originated and were first domesticated in the Andes Mountains of South America (Tantowijoyo and Vande Fliert, 2006). It was observed that in their place of origin, there are many potato varieties, some of which are indigenous varieties and others are hybrid. CIP (2010) reported that there are more than 4300 varieties; they come in many sizes and shapes. There are also 180 wild species though they are too bitter to eat, their important biodiversity include natural resistance to pests, diseases and climatic conditions. Marked morphological differences are found among wild and cultivated potato species. The wide differences in the yield of potato crop varied among the potato varieties and it is affected by the growing pattern (haulm growth, stolon growth and tuber growth). Three important periods can be identified in the growth cycle of the potato: the preemergence/emergence, the haulm growth and tuber growth. Planting to emergence takes 2-4 weeks, tuber initiation starts 3 weeks after



emergence. At first tuber growth is slow and continues at a constant rate as long as the haul is active and green. Tuber growth stops when 80% of the leaves are dead (Beukema and Zaag, 1990). Emergence is affected by environmental factors such as soil moisture and soil temperatures (Tantowijoyo and Vande Fliert, 2006). Plant establishment (haulm growth) shows rapid growth of leaves, stems, new shoots and roots. Plant height, stem number, leaves and ground cover are all reported to vary amongst varieties (Tantowijoyo and Vande Fliert, 2006). Potato varieties vary in Agricultural characteristics such as maturity, tubers (shape, size, colour of skin and flesh, depth of eyes, yield (of a mature crop), dry matter content, consumption quality (cooking behavior and colour after cooking), foliage development, and resistance to diseases (NIVAP, 2011). Potatoes are a heavy feeder of nutrients and require a high amount of nitrogen, phosphorus and potassium. Nitrogen is the first limiting nutrient in potato production that greatly influences growth parameters, yield attributes and yield of crops. Further considerable improvement in the quantity and quality of exhaustive and responsive crops like potato has been observed under the integrated use of organic and inorganic fertilizers as compared to the recommended dose of nutrients applied with chemical fertilizers (Baishya *et al.*, 2012).

Fertilizers are one of the most important inputs of increasing the productivity of crops and modern varieties of different crops (Ali *et al.*, 2009). Fertilizer application has important effects on the quality and yield of potatoes (Leytem and Westermann., 2005). Nitrogen supply also plays an important role in the balance between vegetative and reproductive growth for potatoes (Alva, 2004; White *et al.*, 2007).

Organic material is used to prevent or improve the negative stresses effects in plants and yield decreasing. It is a material to decrease soil salinity, increase the organic matter, improve the soil structure and increase water and air permeability by root developing in soil. It is one the best used fertilizers (Anonymous, 2010; Hassanpanah and Azimi. 2012).

Municipal Waste (MW) constitutes that portion of solid waste stream originating from households, institutions, commercial and service establishments, offices and public facilities and construction and demolition sites (Ghaly *et al.*, 2010). This is in part due to the accumulation of material goods in developed countries and the resourcefulness associated with the recovery and reuse of material in less developed regions of the world (Maso and Blasi, 2008). The MW stream is divided into two categories: putrescible (organic) fraction and non-putrescible fraction. The non-putrescibles do not readily decompose and are represented in the waste stream by glass, metals, textiles, plastics, un-soiled paper products and stones. Putrescibles decompose more readily and are represented in the waste stream by yard and kitchen wastes, soiled paper products and to lesser degree wood (Ghaly *et al.*, 2010).

Study on the effect of Municipal waste fertilizer on potato crop is not sufficiently available but the Municipal waste is rightly available virtually in areas where human settlements exist, many are underused despite the advantages of their use in agriculture. Hence, an experiment was conducted keeping the facts insight to study effect of cured municipal waste and variety on the growth and yield of potato crop.

## **MATERIALS AND METHODS**

### **Experimental Site**

The experiment was conducted at Kweredu, Mangu LGA, Plateau State Nigeria during 2023 wet and dry season. Kweredu is located at about 20km to Mangu along Gindiri-Mangu road located at about longitude E 9°11'53.21256" and latitude N 9°32'16.46916" and at an elevation 1039 meter above sea level, receiving an annual rainfall of 900-1400mm, the



area also has a mean annual minimum and maximum temperatures of 15°C and 22°C, the soil is sandyloam and is one of the potato producing area.

### **Treatments and Experimental Design**

The treatments consisted of three factors, which include: season, cured municipal waste and two potato varieties. The cured municipal waste had five levels which include: 0.0, 3.0, 6.0, 9.0 and 12.0t/ha was properly incorporated into the soil two weeks before planting to provide nutrients. The potato varieties were: Nicola and Marabel which are hybrid, early flowering and high yielding and mature within 60-70 days. Cured municipal wastes were obtained from Angwan Mission Mangu LGA, Plateau state and the potato varieties Marabel and Conect were obtained from Vom-Kuru Jos, Plateau State. Medium sized potato tubers (35-45 mm diameter) were planted by hand in rows with 75 cm inter and 30 cm intra rows and each replicate was divided into 10 plots measuring 3m×2m. This gave a total of 40 plots. A path measuring 1m was left between replication and 0.5m between plots. Other cultural practices like earthing up and weeding were carried out 2 times each during the growing period.

The treatments were factorially combined and laid out in a randomized complete block design (RCBD) with four replications.

### **Cultural Practices**

The experimental site was ploughed and harrowed into a fine tilth manually using hoe in both seasons. The total field size was 408m<sup>2</sup>. The experiment was replicated four times, each replication has ten plots the gross and net plot sizes were 3 x 2m. A gap of 0.5m between plots and one meter between each replication were allowed to serve as irrigation channel and ley way.

Furrows or trenches were dug 10cm deep 75cm apart. Potatoes were placed in the furrows; ensure that the sprouts are turned upwards, with about 30cm between each seed potato for the wet and dry seasons, respectively.

Fourteen days prior to sowing during the wet and dry seasons, cured municipal waste was applied according to the treatment (0.0, 3.0, 6.0, 9.0 and 12.0t/ha) in a single dose and incorporated to a depth of about 5-6cm into the plots and the plot was irrigated to stimulate biodegradation for the dry season.

First light weeding was carried out manually using simple hoe at 2-3 weeks after planting (WAP) and second weeding at 5-6 (WAP) just before the canopy closes.

The potato crop was irrigated once in two days or whenever the soil is drying out thereafter the tuber bulking stage and when the foliage begins to yellow and die back the water is withdrawn.

The field was sprayed with fungicide to control blight disease. A measure which effectively helps in controlling potato blight disease.

As the potato plants grow, soil is mounded around the branches to cover any exposed tubers to prevent the potatoes from turning green and increase yield.

The two potato varieties attained full maturity and were harvested manually using small hoe. The net plots were harvested to determine the yield and yield components in each season.

### **Data Collection and Analysis**

Data was collected from the middle two rows; the 2 utmost rows and terminal plants were considered as guards. The measured parameters were the growth (plant height, number of branches, number of leaves) and yield of potato (number of tubers, weight of tuber per plot, number of tubers per plant, weight of tuber, potato weight classification) these was done at 14, 28, 42 and 56 days after planting (DAP). The data collected were subjected to statistical



analysis as described by Steel and Torrie (1981). Least Significant Difference LSD (0.05) was used to separate the significantly different means and their interactions.

## RESULTS AND DISCUSSION

### Physico-chemical Properties of the Soils and Cured Municipal Waste at the Experimental Sites

**Table 1:** Physico-chemical Properties of Cured Municipal Waste and Soils at the Experimental Sites (0-30cm depth)

Characteristics	Soil 2023	Cured Municipal Waste 2023
<b>Physical analysis</b>		
<b>Particle size distribution (%)</b>		
Sand	42.36	-
Silt	33.80	-
Clay	22.82	-
Textural class	Sandy loam	-
<b>Chemical analysis</b>		
P H	4.9	8.4
Organic carbon (g/kg)	1.2	6.8
Total nitrogen (g/kg)	62.3	90.2
C:N	5.3	11.3
Available P (mg/kg)	8.7	7.5
CEC (Cmol/kg)		
<b>Exchangeable bases (Cmol/kg)</b>		
Ca	120.0	140.0
Mg	72.0	72.0
K	198.2	496.2
S	6.7	37.1
Zn	2.4	7.2
Na	1.0	2.3
BS (%)	0.2	0.8

### Plant Height (cm)

Table 2 showed the result of the effect of season, municipal waste and variety on potato plant height during the 2023 wet and dry seasons. The result revealed that potato plant height was significantly affected by season at 28, 42 and 56 days after planting (DAP). Wet season produced significantly ( $P \leq 0.05$ ) taller plants than the dry season. Variety also was found to be significant at 56 DAP. Variety Nicola produced significantly ( $P \leq 0.05$ ) taller plants than Marabel. The variations in plant height among varieties were most probably due to plant genetics and quality of plant materials used (Eaton *et al.*, 2017).

Application of municipal waste significantly ( $P \leq 0.05$ ) increased potato plant height at all growth stages in both seasons. Plant height increased with increasing application of municipal waste levels during the two seasons. However, the application of 12.0t/ha of municipal waste produced significantly ( $P \leq 0.05$ ) taller plants than the control in all the DAP. Interaction between season and variety of potato plant height was found to be highly significant at 42 DAP. When the interaction was examined across the season and variety, it was revealed that Marabel and Nicola produced taller potato plants in the wet season (Table 3). This result corresponds with the findings of Bhujel *et al.*; (2021).

**Table 2:** Effect of Season, Variety and Municipal waste on Potato Plant height (cm) at various growth stages

Treatment	Days after planting			
	14	28	42	56
<b>Season</b>				
Wet	16.58	24.28 <sup>a</sup>	31.13 <sup>a</sup>	34.52 <sup>a</sup>
Dry	13.65	18.06 <sup>b</sup>	23.58 <sup>b</sup>	25.96 <sup>b</sup>
LS	NS	*	*	*
LSD (0.05)	1.51	1.72	1.13	1.21
<b>Variety</b>				
Nicola	16.01	22.28	27.63	31.48 <sup>a</sup>
Marabel	14.22	20.06	27.07	29.00 <sup>b</sup>
LS	NS	NS	NS	*
LSD (0.05)	1.51	1.72	1.13	1.21
<b>Municipal waste (t/ha)</b>				
0.0	11.27 <sup>e</sup>	17.58 <sup>d</sup>	23.98 <sup>e</sup>	26.78 <sup>e</sup>
3.0	13.28 <sup>d</sup>	19.53 <sup>c</sup>	25.43 <sup>d</sup>	28.17 <sup>d</sup>
6.0	15.50 <sup>c</sup>	21.42 <sup>b</sup>	27.06 <sup>c</sup>	30.34 <sup>c</sup>
9.0	16.98 <sup>b</sup>	23.21 <sup>a</sup>	29.20 <sup>b</sup>	31.47 <sup>b</sup>
12.0	18.54 <sup>a</sup>	24.12 <sup>a</sup>	31.09 <sup>a</sup>	34.46 <sup>a</sup>
LS	*	*	*	*
LSD (0.05)	0.60	0.69	0.45	0.48
<b>Interaction</b>				
S×MW	NS	NS	NS	NS
V×MW	NS	NS	NS	NS
S×V	NS	NS	*	NS
S×V×MW	NS	NS	NS	NS

<sup>abcd</sup> Means with different superscript within column differed significantly ( $P < 0.05$ ), LS = Level of Significance, \* = Significant at 5% level of probability, NS = Not significant

### Number of Leaves

The effect of season and variety on the number of leaves at 14, 28, 42 and 56 DAP in both seasons was not significant (Table 4). Application of municipal waste significantly ( $P \leq 0.05$ ) increased potato number of leaves at 14 and 28 DAP during the growth stages in both seasons. Number of leaves significantly increased with increasing application of municipal waste at 12.0t/ha during the two seasons. The result of interaction on number of leaves at 28 DAP during the both season trial showed that, irrespective of variety under study, it was observed that number of leaves systematically increased with every increase in municipal waste up to 12.0t/ha. On the other hand, Nicola produced a significantly higher number of leaves at 28 DAP only while Marabel at 9.0t/ha level of applied municipal waste produced a higher number of leaves at 28 DAP (Table 5). Generally, application of combination of 12.0t/ha under Nicola produced statistically the higher number of leaves.





**Table 3:** Effect of Season, Variety and Municipal waste on Potato Number of leaves at various growth stages

Treatment	Days after planting			
	14	28	42	56
<b>Season</b>				
Wet	6.66	8.62	12.71	14.88
Dry	6.98	8.68	12.80	13.08
LS	NS	NS	NS	NS
LSD (0.05)	0.33	0.36	1.17	1.20
<b>Variety</b>				
Nicola	6.98	8.78	12.39	13.53
Marabel	6.67	8.52	13.12	14.43
LS	NS	NS	NS	NS
LSD (0.05)	0.33	0.36	1.17	1.20
<b>Municipal waste (t/ha)</b>				
0.0	4.85 <sup>c</sup>	7.81 <sup>c</sup>	12.30	13.69
3.0	6.10 <sup>bc</sup>	8.16 <sup>b</sup>	13.19	13.75
6.0	7.13 <sup>ab</sup>	9.01 <sup>a</sup>	12.61	14.56
9.0	7.59 <sup>ab</sup>	9.15 <sup>a</sup>	12.57	14.09
12.0	8.43 <sup>a</sup>	9.13 <sup>a</sup>	13.10	13.82
LS	*	*	NS	NS
LSD (0.05)	1.13	0.14	0.47	0.48
<b>Interaction</b>				
S×MW	NS	NS	NS	NS
V×MW	NS	*	NS	NS
S×V	NS	NS	NS	NS
S×V×MW	NS	NS	NS	NS

<sup>abcd</sup>Means with different superscript within column differed significantly ( $P < 0.05$ ), LS = Level of Significance, \* = Significant at 5% level of probability, NS = Not significant

### Number of Branches

The effect of season and variety on potato number of branches during the both seasons are presented in Table 6. The result revealed that season, and variety had no significant effect on the number of branches. The result further showed that application of municipal waste significantly ( $P \leq 0.05$ ) increased potato number of branches at 28 and 42 DAP during the growth stages in both seasons. Number of branches significantly increased with increasing application of municipal waste at 3.0 and 12.0t/ha during the two seasons. However, the application of 6.0t/ha of municipal waste produced a statistically similar number of branches with 12.0t/ha at 42 DAP, which produced significantly ( $P \leq 0.05$ ) more branches than the control in all the DAP (Table 6). Besides affecting soil fertility, it promotes changes in biological properties of soil either directly or indirectly (Araujo *et al.*, 2010).

**Table 4:** Effect of Season, Variety and Municipal waste on Potato Number of branches at various growth stages

Treatment	Days after planting			
	14	28	42	56
<b>Season</b>				
Wet	1.66	1.84	1.87	2.33
Dry	1.44	1.68	2.02	2.13
LS	NS	NS	NS	NS
LSD (0.05)	0.14	0.16	0.15	0.14
<b>Variety</b>				
Nicola	1.43	1.64	1.88	2.24
Marabel	1.67	1.88	2.01	2.22
LS	NS	NS	NS	NS
LSD (0.05)	0.14	0.16	0.15	0.14
<b>Municipal waste (t/ha)</b>				
0.0	1.59	1.81 <sup>a</sup>	1.80 <sup>c</sup>	2.14
3.0	1.61	1.87 <sup>ab</sup>	1.97 <sup>ab</sup>	2.26
6.0	1.53	1.78 <sup>ab</sup>	2.03 <sup>a</sup>	2.25
9.0	1.49	1.66 <sup>b</sup>	1.90 <sup>bc</sup>	2.24
12.0	1.53	1.69 <sup>b</sup>	2.03 <sup>a</sup>	2.26
LS	NS	*	*	NS
LSD (0.05)	0.06	0.07	0.06	0.06
<b>Interaction</b>				
S×MW	NS	NS	NS	NS
V×MW	NS	NS	NS	NS
S×V	NS	NS	NS	NS
S×V×MW	NS	NS	NS	NS

<sup>abcd</sup> Means with different superscript within column differed significantly ( $P < 0.05$ ), LS = Level of Significance, \* = Significant at 5% level of probability, NS = Not significant

### Effect of Season, Variety and Municipal waste on Potato Tuber Per stand, Tuber Weight (kg), Mean Tuber Weight and Total Yield (kg) Per Hectare

The result revealed that, number of tuber per plant was significantly affected by the seasons. However, significantly ( $P \leq 0.05$ ) affected the variety. The number of tuber per stand increased significantly in the variety Nicola (Tables 7). Application of municipal waste levels significantly ( $P \leq 0.05$ ) increased the number of tuber per plant (Tables 7). The number of tuber per plant increased with each increase in municipal waste application up to 12.0t/ha. Interaction between variety and municipal waste levels was significant ( $P \leq 0.05$ ) in the two varieties. Variety Nicola produced more tubers per stand at 12.0t/ha (Tables 8). Interaction between season and variety was significant ( $P \leq 0.05$ ) in the two seasons. Variety Marabel produced more tubers per stand during the wet season (Tables 9). This findings is in accordance with the work of Bhujel *et al.*, 2021 who reported that number of tubers per plant depends on number of main branches per plant; variation on tuber numbers might also be genetic

Tuber weight per plot was significantly ( $P \leq 0.05$ ) affected by variety in both seasons. Nicola produced the highest kilogram tuber weight (Big) per plot during dry season. Application of municipal waste significantly ( $P \leq 0.05$ ) increased kilogram of tuber weight per plot in dry season (Table 7) Weber *et al.*, 2014; Bouzaiane *et al.*, 2014 reported same. The kilogram of tuber weight per plot increased with increasing application of municipal waste up to 12.0t/ha. This could be attributed to the influence of both genetic and environmental

factors as observed by Okonkwo and Chibuzo (2000). Application of 12.0t/ha of municipal waste produced significantly higher kilogram tuber weight per plot than other treatments in dry season (Table 7). However, 6.0 and 9.0t/ha levels of municipal waste produced similar small sized tubers (weight). Interaction between season and municipal waste was significant ( $P \leq 0.05$ ) during the season (Table 10). Dry season produced smaller tuber weight at 6.0t/ha level of municipal waste.

Mean tuber weight per plot was significantly ( $P \leq 0.05$ ) affected by season. Dry season recorded the highest mean tuber weight/plot with 1,629.16kg/ha while wet season recorded the lowest mean tuber weight/plot with 1,102.78kg/ha. Variety has no significant effect on the mean tuber weight. Application of municipal waste significantly ( $P \leq 0.05$ ) increased the kilogram of mean tuber weight per plot. Kilogram of mean tuber weight per plot increased with increasing application of municipal waste up to 12.0t/ha. Application of 12.0t/ha of municipal waste produced significantly higher kilogram of mean tuber weight per plot than other treatments

The total tuber yield per plot was significantly ( $P \leq 0.05$ ) affected by season. Dry season recorded the highest yield/plot with 4,837.50kg/ha while wet season recorded the lowest yield/plot with 3,341.70kg/ha. Total tuber yield was significantly ( $P \leq 0.05$ ) affected by variety. Nicola produced the highest kilogram of tuber weight per plot. This findings concurs well with that of Bhujel *et al.*, (2021). Also, Mahmud *et al.*, (2009) found that seed yield varied with variety.

**Table 5:** Effect of Season, Variety and Municipal waste on Potato Tuber Per stand, Tuber Weight (kg), Mean Tuber Weight and Total Yield (kg) Per Hectare

Treatment	Tubers Per Stand(Kg/ha)	Big	Medium	Small	Mean Tuber Wt (kg/ha)	Total Yield (kg/ha)
<b>Season</b>						
Wet	8.90	1279.20 <sup>b</sup>	1091.70	987.50	1102.78 <sup>b</sup>	3341.70 <sup>b</sup>
Dry	10.10	2104.20 <sup>a</sup>	1620.80	1245.83	1629.16 <sup>a</sup>	4837.50 <sup>a</sup>
LS	NS	*	NS	NS	*	*
LSD (0.05)	0.62	263.74	287.52	203.13	174.35	332.59
<b>Variety</b>						
Nicola	10.55 <sup>a</sup>	2012.50 <sup>a</sup>	1554.20	1033.33	1497.22	4491.70 <sup>a</sup>
Marabel	8.45 <sup>b</sup>	1370.80 <sup>b</sup>	1158.30	1200.00	1234.72	3687.50 <sup>b</sup>
LS	*	*	NS	NS	NS	*
LSD (0.05)	0.62	263.74	287.52	203.13	174.35	332.59
<b>Municipal waste (t/ha)</b>						
0.0	6.19 <sup>e</sup>	979.20 <sup>d</sup>	947.90 <sup>b</sup>	708.30 <sup>c</sup>	878.50 <sup>e</sup>	2552
3.0	8.19 <sup>d</sup>	1531.30 <sup>c</sup>	968.70 <sup>b</sup>	979.20 <sup>b</sup>	1159.70 <sup>d</sup>	3364
6.0	9.63 <sup>c</sup>	1562.50 <sup>c</sup>	1145.80 <sup>b</sup>	1281.30 <sup>a</sup>	1326.40 <sup>c</sup>	3916.70 <sup>c</sup>
9.0	10.81 <sup>b</sup>	1875.00 <sup>b</sup>	1781.30 <sup>a</sup>	1281.30 <sup>a</sup>	1555.60 <sup>b</sup>	4802.10 <sup>b</sup>
12.0	12.69 <sup>a</sup>	2510.40 <sup>a</sup>	1937.50 <sup>a</sup>	1333.30 <sup>a</sup>	1909.70 <sup>a</sup>	5812.50 <sup>a</sup>
LS	*	*	*	*	*	NS
LSD (0.05)	0.25	105.50	115.01	81.25	69.74	133.04
<b>Interaction</b>						
S×MW	NS	NS	NS	*	NS	NS
V×MW	*	NS	NS	NS	NS	NS
S×V	*	NS	NS	NS	NS	NS
S×V×MW	NS	NS	NS	NS	NS	NS

<sup>abcd</sup>Means with different superscript within column differed significantly ( $P < 0.05$ ), LS = Level of Significance, \* = Significant at 5% level of probability, NS = Not significant



**Table 6:** Variety and Municipal waste Interaction on Potato Tuber Per Stand

Municipal waste (t/ha)	Variety	
	Nicola	Marabel
0.0	6.75 <sup>e</sup>	5.63 <sup>e</sup>
3.0	8.63 <sup>d</sup>	7.75 <sup>de</sup>
6.0	10.00 <sup>c</sup>	9.25 <sup>cd</sup>
9.0	12.13 <sup>b</sup>	9.50 <sup>cd</sup>
12.0	15.25 <sup>a</sup>	10.13 <sup>c</sup>

<sup>abcd</sup>Means with different superscript differed significantly (P<0.05)

**Table 7:** Season and Variety Interaction on Potato Tuber Per Stand

Season	Variety	
	Nicola	Marabel
Wet	9.50 <sup>b</sup>	11.60 <sup>a</sup>
Dry	8.30 <sup>c</sup>	8.60 <sup>c</sup>

<sup>abcd</sup>Means with different superscript differed significantly (P<0.05)

**Table 10:** Season and Municipal waste Interaction on Potato Weight of Small Tuber (kg) Per Hectare

Municipal waste (t/ha)	Season	
	Wet	Dry
0.0	499.99 <sup>d</sup>	916.67 <sup>c</sup>
3.0	604.17 <sup>d</sup>	1354.17 <sup>bc</sup>
6.0	875.00 <sup>cd</sup>	1791.67 <sup>a</sup>
9.0	1250.00 <sup>bc</sup>	1312.50 <sup>bc</sup>
12.0	1708.33 <sup>ab</sup>	854.17 <sup>d</sup>

<sup>abcd</sup>Means with different superscript differed significantly

## CONCLUSION AND RECOMMENDATIONS

In conclusion however, application of municipal waste significantly increased growth and yield of potato. Variety Nicola performed better compared to Marabel. Generally, the performance of variety Nicola when subjected to varying levels of municipal waste on different growth and yield parameters during the two seasons was better and higher compared to variety Marabel. Based on these findings Municipal waste level of 12.0t/ha is suggested for use in order to obtain higher potato growth and yield, variety Nicola is suggested for use by potato farmers in the study area.

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