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Original Research Article

The influence of time and methods of application of D.I grow on growth and yield on irish potato under Busogo conditions in Rwanda

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Abstract

Irish potato is one of the most important and fast growing food crop, especially in highlands of Rwanda. This research was carried out in order to assess the effect of time and methods of application of D.I grow on growth and yield of Irish potato production under Busogo conditions in Rwanda. To achieve this objective the soil sample collected from experiment field were tested in the CAVM laboratory for determination of the soil nutrient content and the factorial experimental was laid out in randomized complete block design (RCBD) with three replications and comprising four treatments such as F1T1: Inoculation with spraying at foliage stage, F1T2: Inoculation with spraying at tuber growth stages; F2T1: Spraying at foliage stage and F2T2: Spraying at tuber growth stages. The result of this research shown that the highest yield was obtained in F2T1 (spraying at foliage stage) with 41.1 tons ha^{-1} and the lowest was observed in F1T1 (inoculation with spraying at foliage stage) with 37.4 tons ha^{-1}. From these results, the spraying of D.I Grow plus fertilizers during vegetative and tuber growth stages should be advisable to the farmers in order to maximize their profits and Irish potato productivity.

Keywords: D.I Grow, inoculation, potato, spraying, tuber

INTRODUCTION

According to the Rwanda Agricultural Survey 2006, a demonstration study on 20 years showed that the total production of most of the food crops declined or rarely increased very slightly, while the total human population of the country almost doubled (NISR, 2006).

Rwanda is the third largest producer of Irish potatoes in Sub-Saharan Africa according to the International Potato Center's (CIP, 2008) most recent estimates. It is the country's most important crop after plantains. Irish potato is the one among the main staple crops in terms of growth and yield and plays a major role in national food, nutritional security and reduction of hunger.

Any effort in crop production is achieved through increasing productivity rather than expansion of production area by combination of proper use of improved seeds and agricultural techniques including land preparation, proper fertilizers application methods and time and use of proper inputs and reducing crop losses due to pest and diseases.

The Rwandans have cultivated irish potato (*Solanum tuberosum L)* since many years ago as low yields crop for consumption, but their soil fertility has been going declined slowly due to demographic pressure and continuous cultivation without adequate of replenation nutrients up taken by the previous crops. Irish potato production is still facing serious problems due to soil fertility, pests and diseases; poor agricultural practices, inadequate use of agriculture inputs and inappropriate

Table 1. Monthly meteorological data during crop growth period (2013-2014) at main agricultural research station, CAVM-Busogo

Months	Rainfall (mm) 2013-2014	Temperature (°c) Mean maximum 2013-14	Mean minimum 2013-14	Relative humidity (%) 2013-14
February2013	152.2	23.0	9.0	79.6
April	161.5	21.8	11.7	86.6
May	125.4	20.6	10.9	82.9
June	7.5	21.4	8.4	74.9
July	5.2	22.5	7.3	XXX
August	8.6	21.7	9.2	68.3
September	188.2	21.8	10.4	83.5
October	108.4	22.1	9.3	82.2
November	184.0	21.4	9.8	85.5
December	130.2	21.8	10.4	85.0
January 2014	88.7	22.8	9.4	84.1
Total	1159.9	240.9	105.8	812.6

Source: CAVM Busogo meteorological station 2013-2014

best management practices for fertilizer that result to poor productivity.

These have inspired to carry out this research to assessing effectiveness of time and methods D.I. grow application in terms of growth and yield of Irish potato as contributing to the productivity, profitability, and sustainability of the potato production system while minimizing any undesirable impact on the environment in the frame of supporting some institutions like RAB and NAEB which are concentrating their efforts to increase its productivity.

MATERIALS AND METHODOLOGY

The field experiment was conducted in Busogo sector in the farm of UR-CAVM Busogo campus. This site is situated in volcanic region. The soil is volcanic type, loose, well aerated and of sandy texture. The physical characteristics of this soil are highly suited for Irish potato production (Idrissa *et al.,* 2006).

The total rainfall during 2013-14 was 1159.9 mm and maximum of 188.2 mm was received in September. The mean maximum temperature ranged from 22.8 ^{o}C (January 2014) to 23.0 ^{o}C (February 2013) during 2013-14. The months of February 23.0 ^{o}C, July, October and January (22.1-22.8 ^{o}C) were the hottest.

The minimum temperature ranged from 20.6 ^{o}C (May) to 21.4^{o}C (June) and the same as in November during 2013-2014. The relative humidity ranged from 68.3 (August) to 86.6 per cent (April) during 2013-2014, the cropping period prevailed from December 2013 to March 2014.

The data on weather parameters such as rainfall (mm), mean maximum and minimum temperature (^{o}C) and relative humidity (%) recorded at Meteorological Observatory, Main Agricultural Research Station, College of Agriculture, Animal science and Veterinary Medicine farm situated in Busogo sector during the experimental year (2013-2014) are presented in the Table 1

The variety used in this study was Kuruseke. This variety is characterized by red tubers, oval to square, with shallow eyes, white flesh with dormancy of 2 to 3 months and a vegetative cycle of 3.5 to 4 months. It is susceptible to downy mildew to bacterial wilt and moderately resistant (ISAR, 2006).

The laboratory materials used during the analysis of soils were: Sieve, Flask, Erlenmeyer, funnels, filter papers, pipette, centrifuge, digester, pH meter, oven dry etc.

Other materials used were: hoes, scale, basin for socking the seeds, jerican for fetching water, screw oga, knapsack for spraying fungicide and fertilizer, sack for carrying samples, graduated ruler for the measurements, Meta screw auger, auger soil scientist; measuring tape, Dithane M45 and bags (packages) for transportation.

The experimental design was Randomized Completely Block Design (RCBD) with 4 treatments replicated thrice. The design had two factors which were;
Factor I: Methods of fertilizer application which were inoculation (soaking) and foliar spraying
Factor II: Time of D.I. Grow fertilizer application" at planting and during Irish potato development stages". According to GUPTA (2005), experiment is device or a means of getting an answer to the problem under consideration. RCBD is the simplest of all the experiment designs based on the principles of randomisation and replication.

Details of treatments combinations

F1T1: Inoculation with spraying from 30-70 DAP
F1T2: Inoculation with spraying from 55-90 DAP
F2T1: Spraying from 30-70 DAP
F2T2: Spraying from 55-90 DAP
With T_1: Foliage stages, T_2: Tuber growth stages, F1**:** Inoculation with spraying and F_2: spraying

During the experiment period, Late blight of potato caused by fungus called *Phtophtora infestans* has been observed as potato disease. In order to control this, 50grams of Dithane M 45 in 20L of water were applied three times.

Statistical analysis

The recorded data related to the Irish potato growth and yield parameters were analyzed by using Gen stat edition 14th one way ANOVA for computing LSD, CV and CD at 5% level of significance and DMRT for mean comparison for data results separation.

Agronomic parameters observed

The experiment start up was on 28th December 2013. The data progress records for growth parameters such as the emergence rate, the plant height and the number of shoot and yield parameters have been recorded up to harvesting time and the number of tuber per plant, the tuber weight and the tuber grades as well.

Growth parameters

The observations were made during the growing period by focusing on the following agronomic parameters**:**

The emergence rate

The emergence rate was taken at 21 DAP and 30 DAP by counting all emerged potato seedlings and percentage was worked out.

Plant height

The plant height of potato was taken by using graduated ruler from 5 plants selected randomly at 30, 45 and 60 DAP and the average was worked out and expressed in cm.

Number of shoot

The number of shoots were counted from 5 plants selected randomly at 30, 45 DAP and the average was worked out and expressed in shoots number.

Yield parameters

The harvesting was carried out by considered the following:

Number of tuber per plant

The number of tuber per plant was counted from 5 plants selected randomly at harvesting time and the average was worked out and expressed in tuber number.

Tuber grades

At harvest, plants of each plot were harvested separately and were measured by using screw oga then graded them depending upon their diameter [Grade A (>55mm), Grade B (45-55mm), Grade C (>35-45mm), Grade D (>28-35mm) and Grade E (<28mm)].

Irish potato yield

At harvest, plants of each plot were harvested separately and were weighed plot per plot then the summation of all plots was extrapolated in tons per hectare.

Harvest index

At harvest, plants of each plot were harvested and separated into root and vegetative parts and their separate weights taken for estimation of the harvest index
The harvest index was worked out by using the following formula :

$$HI = \frac{\text{Economic yeild}}{\text{biological yeild}} \times 100$$

Economic analysis

The price of inputs that were prevailing at the time of their use was considered for working out the cost of cultivation and benefit cost ratio.

Cost of cultivation

Cost of cultivation was calculated based on the price of inputs, the labors and land rent that were prevailing at the

Table 2. The results of laboratory soil analysis

N°	Soil analysis designation	Results obtained	Methods used
1	Available P	33.2ppm	Mehlich III method
2	Exchangeable K	0.15meq/100gr	Mehlich III method
3	Organic C	4.0864%	Walkley and Black modified Method
4	pH H2O	6.05	Electronic method

Table 3. The result of potato emergence rate from 21DAP to 30DAP as influenced by time and methods of application of D.I grow fertilizer.

	At 21DAP			At 30DAP		
T / F	T1	T2	Mean	T1	T2	Mean
F1	22.2	22.2	22.2	90.4	88.1	89.3
F2	14.8	20.0	17.4	73.3	80.7	77.0
Mean	18.5	21.1	**19.8**	81.8	84.4	**83.1**
Factors	**SEm±**	**CD**	**CV**	**SEm±**	**CD**	**CV**
Time	2.18	2.482	11.3	1.85	2.286	7.1
Methods	2.18	2.482		1.85	2.286	
T *F	3.08	2.950		3.51	2.613	

***F1**: Inoculation with spraying method of D.I Grow fertilizer, **F2**: spraying method of D.I Grow fertilizer, **T1**: Application of D.I Grow fertilizer at foliage stage, **T2**: Application of D.I Grow fertilizer at tuber growth stage, **T*F**: Interaction time and methods of D.I Grow fertilizer application.*

time of their use.

Gross returns

Gross returns per hectare were calculated based on prevailing market prices of potato, when the produce was ready for marketing.

Gross returns = **Potato yield × Market price of potato in kilo**

Net returns

Net returns per hectare were calculated by deducting the cost of cultivation from gross returns.

Benefit cost ratio (BCR)

The benefit cost ratio was using for ranking the plots and was calculated by using the following formula:

$$\text{Benefit cost ratio} = \frac{\text{gross returns (rwfs ha}-1)}{\text{cost of cultuvation (rwfs ha}-1)}$$

RESULTS AND DISCUSSION

Soil analysis

As per the results shown during analysis, it was observed that at 21th DAP the first performance in emergence rate was F1T2 and F1T1 with both 22.22% and the last was F2T1 with 14.81%. (Table 2 and 3)

Whereas at 30th DAP the first performance in emergence rate was F1T1 followed F1T2 and the last was F2T1 with 90.36; 88.14 and 73.33% respectively. This difference in emergence rate can be achieved through the inoculation with spraying method (F1).

The adverse effect on plant emergence was more pronounced in treatment F1T1 and F1T2 respectively because of the contents of D.I Grow includes hormones and humic acid was likely to be contacted with the seeds tuber than those of the others treatments. The same observations were also reported by Chowdhury *et al.,* (2002) where he reported that the adverse effect on plant emergence was more pronounced at basal dose application treatments because of the concentration of free ammonia and nitrites was likely more near the seeds tuber than those of other treatments.

Table 4. The results on potato height from 30 DAP to 60 DAP as influenced by time and methods of application of D.I.Grow.

	At 30DAP			At 45DAP			At 60DAP		
T / F	T1	T2	Mean	T1	T2	Mean	T1	T2	Mean
F1	18.38	14.19	16.29	29.58	23.50	26.54	57.2	49.7	53.5
F2	14.84	14.83	14.84	25.17	26.70	25.94	53.2	54.3	53.8
Mean	16.61	14.51	**15.56**	27.38	25.10	**26.24**	55.2	52.0	**53.6**
Factors	**SEm**	**CD**	**CV**	**SEm**	**CD**	**CV**	**SEm**	**CD**	**CV**
Time	0.409	1.075		0.997	1.678		1.76	2.230	
Method	0.409	1.075	1.6	0.997	1.678	4.6	1.76	2.230	7.0
T *F	0.579	1.279		1.410	1.996		2.49	2.652	

***F1**: Inoculation with spraying method of D.I Grow fertilizer, **F2**: spraying method of D.I Grow fertilizer, **T1**: Application of D.I Grow fertilizer at foliage stage, **T2**: Application of D.I Grow fertilizer at tuber growth stage, **T*F**: Interaction time and methods of D.I Grow fertilizer application.*

Table 5. The results on number of shoots from 30 DAP to 45 DAP as influenced by time and methods of application of D.I.Grow.

	At 30DAP			At 45DAP		
T / F	T1	T2	Mean	T1	T2	Mean
F1	1.733	1.933	1.833	2.93	3.60	3.27
F2	1.467	1.400	1.433	2.93	3.60	2.73
Mean	1.600	1.667	**1.633**	2.90	3.10	**3.00**
Factors	**SEm±**	**CD**	**CV**	**SEm±**	**CD**	**CV**
Time	0.1018	0.536	7.1	0.179	0.711	10.1
Method	0.1018	0.536		0.179	0.711	
T *F	0.1440	0.637		0.253	0.845	

***F1**: Inoculation with spraying method of D.I Grow fertilizer, **F2**: spraying method of D.I Grow fertilizer, **T1**: Application of D.I Grow fertilizer at foliage stage, **T2**: Application of D.I Grow fertilizer at tuber growth stage, **T*F**: Interaction time and methods of D.I Grow fertilizer application.*

The potato height as influenced by time and fertilizer application methods

With respect to the results shown during analysis, it was observed that both at 30, 45, and 60th DAP the first performance in plant height was F1T1 and the last was F1T2 considered to the last data recorded their height mean were 57.24 and 50.95cm respectively. (Table 4)

The increasing of plant height may be due to the role of such macro and micro nutrients in the physiological process and cell division and elongation which indirectly effect tissue formation and consequently vegetative growth of plant. These results are in accordance with those obtained by (Khalifa *et al.,* 2003, Abdul Rasool *et al.,* 2010 and Kadum, 2011). This might be due to the better distribution of D.I Grow plus fertilizer that contains N and the similar results were also reported by Sharma *et al.,* (2011) where he reported that the plant height is due to better availability of N fertilizer and enhancing the effect of N on plant vegetative growth.

The number of shoots as influenced by time and fertilizer application

Concerning the results shown during analysis, it was observed that at 30th DAP the first performance in number of shoots was F1T2 followed by F1T1 with 1.93 and 1.73 shoots respectively and the last was F2T2 with 1.4 shoots. (Table 5)

Whereas at 45th DAP the first performance in number of shoots was F1T1 followed by F1T2 with 3.93 and 3.6 shoots respectively and the last was F2T2 with 2.6 shoots and the results of ANOVA indicated that there was no significant difference with a grand mean of 3.00 shoots between treatments.

This high number of shoots can be achieved through the inoculation with spraying in foliage stage and in tuber growth stage because the contents of D.I Grow includes hormones and humic acid which are likely to makes soils more friable. As per similar results of Shayanowako *et al.,(* 2014) who reported that a loose friable soil that is warm and moist increases sprout emergence leading to high shoot number per plant and Gathungu *et al.,* (2000**)**

Table 6. The results on number of tubers as influenced by time and methods of application of D.I.Grow.

Number of tuber par plant			
T / F	T1	T2	Mean
F1	16.7	11.7	14.2
F2	11.7	12.9	12.3
Mean	14.2	12.3	**13.3**
Factors	**SEm±**	**CD**	**CV**
Time	1.49	2.051	
Methods	1.49	2.051	12.4
T *F	2.10	3.66	

***F1**: Inoculation with spraying method of D.I Grow fertilizer, **F2**: spraying method of D.I Grow fertilizer, **T1**: Application of D.I Grow fertilizer at foliage stage, **T2**: Application of D.I Grow fertilizer at tuber growth stage, **T*F**: Interaction time and methods of D.I Grow fertilizer application.*

Table 7. The results on potato yield and harvest index as influenced by time and of D.I.Grow application methods.

Total yield (tha^{-1})				Harvest index (%)		
T / F	T1	T2	Mean	T2	T2	Mean
F1	39.2	39.3	39.3	39.3	75.1	72.4
F2	41.1	37.5	39.3	37.5	72.0	71.0
Mean	40.2	38.4	**39.3**	38.4	73.5	**71.7**
Factors	**SEm±**	**CD**	**CV**	**CD**	**CD**	**CV**
T	2.37	2.587	3.0	2.587	2.159	3.0
F	2.37	2.587		2.587	2.159	
T *F	3.36	3.081		3.081	2.565	

***F1**: Inoculation with spraying method of D.I Grow fertilizer, **F2**: spraying method of D.I Grow fertilizer, **T1**: Application of D.I Grow fertilizer at foliage stage, **T2**: Application of D.I Grow fertilizer at tuber growth stage, **T*F**: Interaction time and methods of D.I Grow fertilizer application.*

was found that early and splitting application of fertilizer that contains N led to a faster early growth in plant height, number of shoots, tubers, stolons and dry matter.

The number of tubers as influenced by time and D.I grow fertilizer application methods

As the results shown during analysis, it was observed that the number of tuber per plant range between 11.73 to 16.73 tubers per plant. Similar results were also reported by Soltner, (1975) wherein he reported that the number of tuber varies from 3 to 20 tubers in normal condition. (Table 6)

In this research the maximum number of tubers per plant was found in inoculation with spraying in foliage stage (F1T1) with 16.73 tubers and the minimum was found in spraying in both foliage and tuber growth stages (F2T1 and F2T2) with 11.73 tubers. Gupta, (2005) reported that the optimum fertilizer use efficiencies was maximized the tuber formation consequently increase the number of tubers due to the contact of phosphorus which has good impact on crop quality include increasing the number of tuber per plant and tuber grades.

The potato yield and harvest index as influenced by time and D.I grow fertilizer application methods

With respect to the results shown during analysis, it was observed that the mean yield range from 41.1 to 37.4 ton per hectare of F2T1 and F1T1 respectively with grand mean 39.3 ton per hectare. Regarding the results of ANOVA there was no significant difference between treatments. (Table 7)

D.I Grow foliar fertilizer which was high in N; growth

Table 8. The results on potato tuber grades as influenced by time and methods of D.I.Grow fertilizer application

	GRADE A			GRADE B			GRADE C			GRADE D			GRADE E		
T / F	T1	T2	Mean	T1	T2	Mean	T1	T2	Mean	T1	T2	Mean	T1	T2	Mean
F1	12.00	13.00	12.50	3.87	3.58	3.73	0.825	0.600	0.713	0.425	0.108	0.267	0.175	0.033	0.104
F2	12.00	12.67	12.33	4.35	3.00	3.67	1.100	0.617	0.858	0.367	0.217	0.292	0.317	0.058	0.188
Mean	12.00	12.83	**12.42**	4.11	3.29	**3.70**	0.963	0.608	**0.785**	0.396	0.396	**0.279**	0.246	0.046	**0.146**
Factors	**SEm**	**CD**	**CV**	**SEm**	**CD**	**CV**	**SEm**	**CD**	**CV**	**SEm**	**CD**	**CV**	**SEm**	**CD**	**CV**
Time	0.825	1.526		0.595	1.296		0.133	0.613		0.099	0.529		0.109	0.557	
Method	0.825	1.526	4.2	0.595	1.296	12.9	0.133	0.613	14.7	0.099	0.529	14.2	0.109	0.557	15.0
T *F	1.167	1.815		0.842	1.542		0.188	0.729		0.140	0.629		0.155	0.662	

***F1**: Inoculation with spraying method of D.I Grow fertilizer, **F2**: spraying method of D.I Grow fertilizer, **T1**: Application of D.I Grow fertilizer at foliage stage, **T2**: Application of D.I Grow fertilizer at tuber growth stage, **T*F**: Interaction time and methods of D.I Grow fertilizer application.*

regulator (plant hormones) and containing humic acid content play important role in the balance between vegetative and reproductive growth of potato, many previous studies have shown that the fertilizer N application can boost total yield and /or marketable tuber yield (Kara, 2002; Zebarth *et al.,* 2004; Zelalem *et al.,*2009), and foliar treated potato plant with humic acid gave higher number of stems/shoots, plant height, mean tuber weight and total yield (Kadum, 2011).

Gathungu *et al*., (2000) found that early and well distribution of fertilizer that contains N led to faster early growth in plant height, number of shoots, tubers, stolons and dry matter. The effect of well distribution of N fertilizer on the potato yield might be due to the improvement in plant emergence and early vegetative growth similar results was also reported by Chowdhury *et al.,* (2002)

Similary, it was observed that the first performance in harvest index was recorded in spraying in tuber growth stages (F2T2) with 75.06% and the lowest was noticed in inoculation with spraying in tuber growth stages (F1T2) with 69.66%.

The highest yield in tuber and biomass was achieved with basal dose and spraying application of N fertilizer Chowdhury *et al,* (2002).

The potato tuber grades as influenced by time and D.I grow fertilizer application methods.

With regards to the results shown during analysis, it was observed that the mean tuber grade A ranges from 11 to 13 Kilograms of F2T2 and F2T1 respectively with grand mean 12.42 Kilograms. As well as the difference in potato tuber between the treatments should be due to effect of K and N both elements are vital and important in tuber formation (ISAR, 2004) and foliar fertilizer caused an increase in tuber weight as compared with those of other applications, it might be attributed to the increase in vegetative growth by fertilizer and in the role of K in translocation of produced photosynthetic assimilates and its accumulation in storage organs (Habib *et al.,* 2011). (Table 8)

The mean tuber grade B ranges from 9 to 3.58 Kilograms of F1T1 and F2T2 respectively with grand mean 3.70 Kilograms. Regarding the results of ANOVA there was no significant difference between treatments at 5% level of significance.

The mean tuber grade C ranges from 1100 grams to 600grams of F2T1 and both F2T2; F1T1 respectively with grand mean 785 grams. Regarding the results of ANOVA there was no significant difference between treatments at 5% level of significance.

The mean tuber grade D ranges from 425grams to 108 grams of F1T2 and both F2T2 respectively with grand mean 279 grams. Regarding the results of ANOVA there was no significant difference between treatments at 5% level of significance.

The mean tuber grade E ranges from 314 grams to 33 grams of F2T2 and both F2T1 respectively with grand mean 146 grams. Regarding the results of ANOVA there was no significant difference between treatments.

The difference in diameter of tuber might be due to the effect of potassium which is responsible for both tuber growth and size of tuber (Onditi *et al.,* 2012). Similar results were observed by El-Sirafy *et al.,* (2008).

The application of N fertilizer significantly promoted vegetative growth representing the highest value of plant height, leaf area index, number of leaves, number of shoots, dry shoots yield, phosphorus percentage in shoots and tuber, tuber sizes weight and diameter as well as total tuber yield as reported by Yassen *et al.,* (2011).

Economics

The cost benefit ratio from different treatments varied between 1.43 and 1.80 in accordance with the prevailing prices. Sprayed treatments at foliage stage (F2T1) had the higher net returns (2,743,664 Rwfs) with higher benefit cost ratio (1.80) rather than other and gave comparatively higher yield and inoculated with spraying treatments at foliage stages (F1T1) had the lower net returns (1,689,260Rwfs) among other treatments in both either cost benefit ratio (1.43) or yield; similar results was observed by Amare Tesfaw (2013) who reported that nitrogen fertilizer application of 300 kg ha^{-1} gave the highest yield of 20.23 t ha^{-1}. But with increasing level of rate of nitrogen fertilizer and/or partly related with the right type of input, the highest total variable cost was incurred and the highest benefit cost ratio was obtained as a result of nitrogen fertilizer application of 300 kg ha^{-1}.

CONCLUSION

This research was carried out in CAVM -Busogo farm in order to determine the best method and time of D.I.Grow fertilizer application in terms of growth and yield of Irish potato production. The experimental design was Randomized complete block design (RCBD). After the analysis of the data on various agronomic parameters we come up with the following conclusion:

In terms of overall growth parameters; D.I grow fertilizer applied through inoculation with spraying from 30-70DAP were significantly enhanced those parameters whereas for yield parameters; D.I grow fertilizer applied through spraying both in vegetative and tuber growth stages were significantly enhanced the most of those parameters.

Accordance to the economic analysis the D.I grow fertilizer applied through spraying from 30-70 DAS followed by spraying from 55-90 DAP were both more profitable and higher yield rather than those which inoculated with spraying in vegetative or tuber growth stages.

Generally, this research showed that the spraying gave the highest yield of 41.1tons per hectare that were more compared to those expected in Rwanda (9-40 tons per hectare MINAGRI, 2010) because of the D.I Grow fertilizer's theory **"**Increases yields from 30% - 300%**"** and the lowest were inoculated with spraying which gave the yields of 37.4 tons per hectare.

It could be concluded that increasing productivity of potato plants resulted from foliar fertilization which increased the weight and number of tubers per plant and in return increased the total tuber yield. From these results, the spraying of D.I Grow plus fertilizers during vegetative and tuber growth stages should be advisable to the farmers in order to maximize their profits and Irish potato productivity.

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