



Growth and Yield Performance of Different Potato Varieties under Upland Condition in Cambodia

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Abstract In Cambodia, potato is imported. Currently, potato has the fourth largest production in the world cultivated in many countries even in semi-arid and tropical countries. Numerous new and improved varieties were developed to sustain and maintain production systems. Thus, performance evaluation of these varieties in Cambodia condition is important to improve potato production in the country. The experiment was conducted from December 2016 to March 2017 by testing 8 different imported varieties (Tornado, Corodana, Georgina, Madeira, Jelly, Julkinka, Red fantasy and Sorentina) under upland climate of Cambodia. The result showed that all varieties showed similar performance in terms of growth, but different in yield components and yield. Tornado variety was most adapted and productive varieties with an average yield of 23ton ha⁻¹ followed by Madeira (19 ton ha⁻¹) while Red fantasy had the lowest production among the tested varieties under upland environment in Cambodia.

Keywords: Tornado, Madeira, Mondulkiri, upland, Cambodia.

INTRODUCTION

Potato, *Solanum tuberosum* L., is considered as an important source of carbohydrate and plays a key role for food security in many develop and developing countries (Scott *et al.*, 2000). Thus, potato is currently the fourth largest production crop next after rice, corn and wheat (FAOSTAT, 2006). At the present, potato is fast adapted and grown throughout the continents, though the crop prefers cool climate (18 °C without chilled) follow by warm environment (Havetkort and Struik, 2015). Optimum yield, at least 20 ton per hectare, has been attained in most temperate regions with average temperature of around 18-20°C. High temperature, in the face of climate change, is one of limiting

factors affecting potato production which is commonly found in most tropic and subtropics countries. In Cambodia, where the average daily temperature exceeds higher than 28 °C, fresh potato is imported mostly from Vietnam, Thailand and China. A number of production problems that account for such low yield have been identified. The major concerning of low and poor production were lack of well adapted cultivars, unavailability and high cost of seed tubers, inappropriate agronomic practices, diseases, insect pests, inadequate storage, transportation and marketing facilities (MAFF, 2016). As potato production continuously expand throughout the world, lots of new improved varieties have been bred and improved for different regions and countries. In connection with climate change, several technology package and new cultivar are highly considered as keys to maintain the production and prevent potato farming from exposed to the threat. Thus, new cultivars that are more resilient to high temperatures have been developed (Monneveux *et al.*, 2014). Some of those varieties were mainly breed in tropical countries (Muthoni and Kabira, 2015).

OBJECTIVE

The study was conducted to understand performance of different potato varieties planted in Mondulkiri province, Cambodia.

METHODOLOGY

Experiment was carried out under field condition from December 2017 to March 2018 at Mondulkiri province (12°28'27" N, 107°12'33" E). The site was 710 meters above the sea level with average of 26 to 30 °C and relative humidity of 70-90% upon the research conducted. Chemical and physical of the field was described in Table 1. The trial was layout in randomize complete block design with 4 replications. The treatment consisted of eight different imported potato varieties namely Tornado (IMP Potato group limited, Ireland) Coronada, Madeira, Goergina, Jelly, Red Fantasy, Jelly, Julinka, Sorentina (Europlant International, Germany).

Table 1 Soil physical and chemical properties analysis of experiment site

EC	pH	P ppm	K cmol _c kg ⁻¹	N %	SOM %	CEC cmol _c kg ⁻¹	Soil Texture			
							Clay	Silt	Sand	Class
38.0	4.20	0.1	0.42	0.29	5.07	72.4	22.3	35.3	42.4	Clay Loam

Source; Soil Laboratory, Faculty of Agronomy, Royal University of Agriculture, Cambodia

Trail was planted at density of 4.8 plants m⁻² in plot of 6 meters long. Spacing of 70 cm between row and 40 cm between plant. Each plot was fertilized with 80 kg N ha⁻¹, 80 kg P₂O₅ ha⁻¹ and 150 kg K₂O ha⁻¹ at planting date. Addition of 40 kg N ha⁻¹ and 100 kg K₂O were applied at ridging (45 days after planting). Weeds and pathogens were controlled chemically at the manufacturer's recommended rate to prevent biotics damage. The plots were surface irrigated every 3 days interval. Plant plants were harvested at 115 days from sowing. Growth and yield parameters were recorded. Plant height was recorded at flowering stage while number of tuber per plant, weight per tuber, weight per plant and marketable yield were measure at harvest.

RESULTS AND DISCUSSION

The result showed that all of the eight varieties reached its normal height and statistically similar to one another ($P_{\text{value}} < 0.05$) (Fig. 1). Lizana *et al.*, (2017) explained that physical changing would not observed when the potato was cultivated under similar or little higher temperature (28 °C) which was about 30-47cm tall. The author also emphasizes that external factors such as high temperature (greater than 28 °C) would cause the change of the plant height.

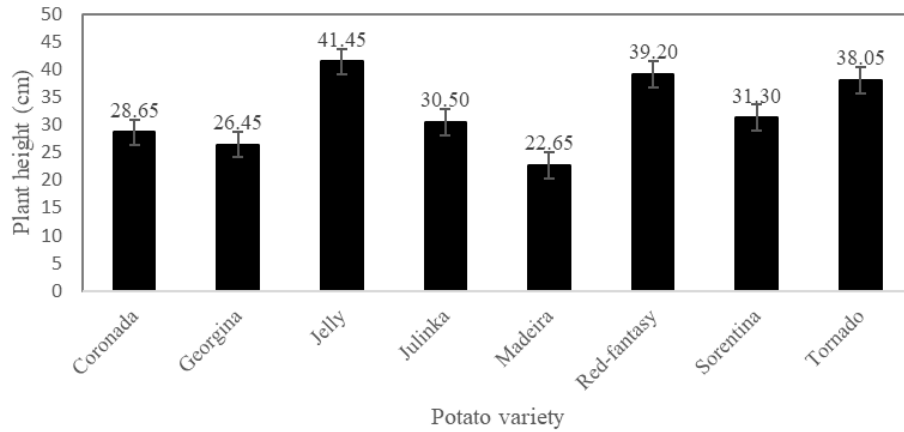
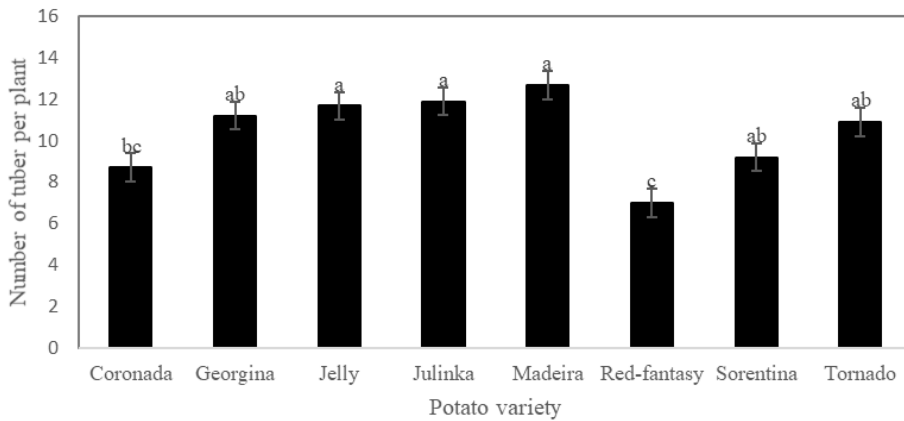


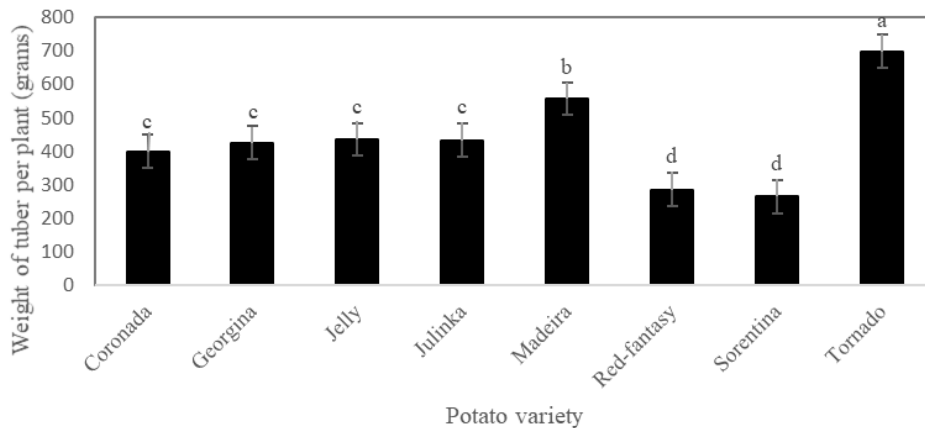
Fig. 1 Plant height at flowering stage of eight varieties

All of yield parameters were observed statistically different ($P_{value} > 0.05$). In terms of yield component, Madeira, Julinka and Jelly had the highest number of tuber compared to Coronada and Red fantasy, but statistically similar to other three varieties (Fig. 2). Notably, the trial showed that Red fantasy produced the lowest number of tubers (Fig.2). In addition, Red fantasy also produced less weight per plant (less than 300 grams per plant) (Fig.3). However, similar result was recorded for Sorentina variety. The highest tuber weight per plant was observed for Tornado variety which could obtain about 700 grams followed by the second highest Madeira (about 600 grams per plant). Other varieties like Coronada, Jelly, Julinka and Georgina was third and not significantly different to one another (Fig.3).



Means within the figure followed by the same letter are not significantly different using LSD (0.05).

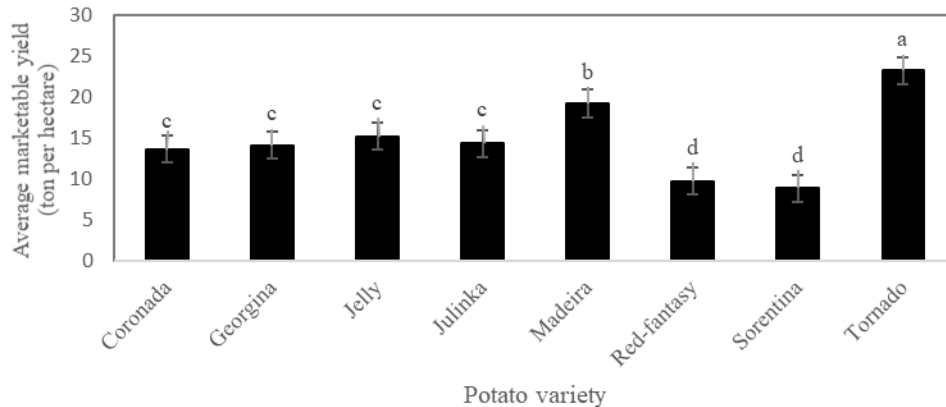
Fig. 2 Tuber produced per plant



Means within the figure followed by the same letter are not significantly different using LSD (0.05).

Fig. 3 Tuber produced per plant

In particular, Tornado, white flesh and red skin color, attained the highest yield (23ton ha⁻¹). It was commendably that different potato varieties result vary response to different growing condition and production system (Masengesho *et al.*, 2012; Gairhe *et al.*, 2017). Gairhe *et al.*, (2017) suggested that improved potato varieties had different response to different field condition such as altitude, soil type and ambient temperature. Author had also claimed that in warm and hot climate countries, most potato could grow well in upland rather than lowland areas, but not all improved varieties showed similar response or obtained higher yield.



Means within the figure followed by the same letter are not significantly different using LSD (0.05).

Fig. 4 Marketable yield obtain in the experiment

CONCLUSION

Our result suggested that all of the eight varieties had similar performance in terms of growth. Majority of the tested varieties were less productive (less than 13 ton ha⁻¹) which 20 percent lower than the average of global yield. However, Tornado and Madeira showed outstanding performance. Thus, Tornado, white flesh color and red skin, and Madeira, yellow flesh and skin color, were more adapted and productive in Mondulkiri province, Cambodia. Despite the yield, most of potatoes severely damage by diseases which literately susceptible for long-term production and suggested that farmers need to purchase and used only certified seeds for the production. However, the price of certified seed would cost 3.00 USD/kg with that farmers need to invest 2,000 to 3,000 USD to hectare cultivation. Thus, yield obtained should at least between 12 to 13 ton per hectare for economic benefit.

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