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Water Management on Furrow and Drip Irrigation System in Growing Potatoes in Thailand

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Abstract

This experiment aimed to compare the nutrient uptake of Atlantic potatoes in the furrow irrigation system and the drip irrigation system in Mae Sai, Chiang Rai Province between November 2022 to February 2023. The experimental employed a group comparison t-test with three replications. The treatments consisted of two irrigation systems: furrow irrigation and drip irrigation, with soil moisture maintained at the field capacity level. A base fertilizer was applied at the rate of 162 kg/ha of N, 162 kg/ha of P_2O_5 and 262 kg/ha of K_2O, and a second fertilizer (46-0-0) was applied at the rate of 12.5 kg/ha when the potatoes reached 30 days after planting. The study found that the water requirement for potatoes was approximately 860 mm per crop in furrow irrigation and 420 mm per crop of dripping irrigation. In term of nutrients uptake, the potatoes grown under furrow irrigation, which a crop duration of 90 days from planting to harvest, yielded 26.25 tons/ha of marketable tubers and the total N, P, K uptake was 156, 23 and 380 kg/ha., respectively. In comparison, drip irrigation resulted in a higher yield of 31.87 tons/ha of marketable tubers with the total amount of N, P, K uptake was 195, 29 and 458 kg/ha, respectively






Material and Methods

Experiment site: Mae sei district, Chaing Rai Province
Planting date: November 2022- February 2023
Potato variety: Atlantic
Treatments: Furrow and Drip irrigation system
Spacing: between rows 90 cm, plant spacing 20 cm.
The experimental collection data: 5.45 meters x 5 meters, 3 replications
Fertilizer application: applying base fertilizer on the soil at the rate of 162.5 N, 162.5 P_2O_5, and 262 K_2O kg/ha on the planting day, the second time, fertilizer with the formula 46-0-0 was applied at furrow in rate of 12.5 kg/ha 30 days after planting.
Watering: flow along the furrows once a week. The drip system was used every 4 days depending on the soil moisture.

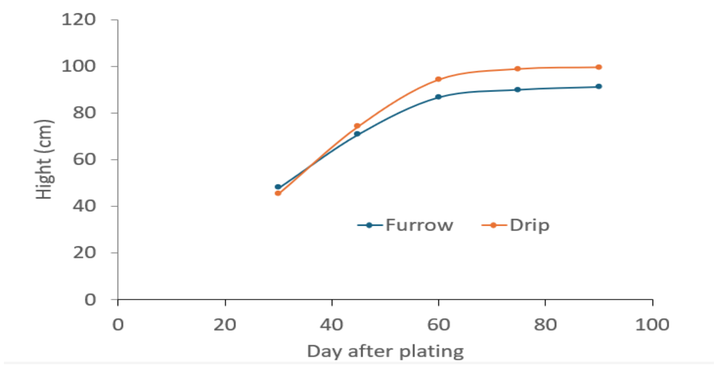
Results

1. **Water requirement:** there was no statistically difference between the furrow and drip irrigation systems at the 0.05 significance level with 95% (Fig. 1).
2. **Plant height:** At 30, 45, 60, 75 and 90 days after planting with two irrigation systems. There was no statistical difference at the 0.05 significance level with 95% .(Table. 1).
3. **Nutrient uptake:** The N P K uptake/ha was higher in the drip irrigation system than the furrow irrigation system (Table 2).
4. **% increase in the total N P K uptake** by the whole plant from the furrow irrigation system to drip irrigation system was 24% for N, 26% for P and 20% for K (Table 3)
5. **Yield and Quality:** the drip irrigation system improved specific gravity, % gross solid and potato yield (21.4%). (Table 4)

Table 1 Potato water requirement in furrow and drip irrigation system

Irrigation system	Water requirement (mm)
Furrow	420
Drip	860

Figure 1 The height of potatoes in furrow and drip irrigation system



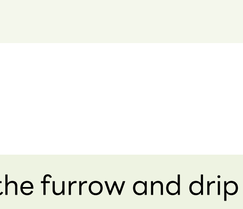
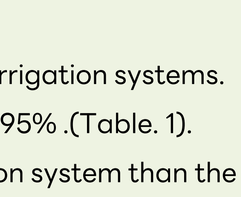



Table 2 N P K uptake (kg/ha) in various parts of potatoes at 90 day after planting (DAP)

irrigation system	parts	N	P	K
			kg/ha	
Furrow	arial stem	62.2	5.54	94.7
	root	3.37	0.42	8.80
	tubers	89.9	17.3	276.
Drip	arial stem	90.5	9.10	142
	root	4.97	0.74	14.3
	tubers	99.8	19.0	301



Table 3 Total N, P, K uptake (kg/ha) and yield in potatoes at 90 day after planting (DAP)

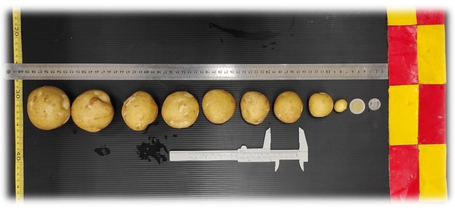
Irrigation systems	Total uptake (kg/ha)		
	N	P	K
Furrow	156	23	380
Drip	195	29	458





Table 4. Specific gravity and gross solid tubers of potato and yields in drip irrigation system and the furrow irrigation system.

Irrigation system	Specific gravity	gross solid %	Yield (ton/ha)
Furrow	1.082	20.6	26.25
Drip	1.089	22.1	31.87

Summary

Drip irrigation system for potato cultivation can save water about 2 times and using drip irrigation system does not make any difference in the height of plant but increases the uptake of N P K nutrients and increases the yield of potatoes.