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Effect of different varieties of potato on irrigation scheduling in terms of growth and yields

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Abstract
A field experiment was conducted on the topic entitled "Effect of different varieties of potato on irrigation scheduling in terms of growth and yields.*"* during the Rabi season of 2019-20 at Main Experiment Statin, Vegetable Research Farm, A. N D. University of Agriculture & Technology Kumarganj, Ayodhya. The treatment consisted of five potato varieties *viz.* K. Ashoka, K. Bahar, K. Neelkanth, K. Khyati, K. Sadabahar, and two irrigation scheduling *viz*. No Water Stress and Water Stress. The experiment was conducted in Factorial RBD and replicated three times. The soil of the experimental field was low in organic carbon (0.40%) and nitrogen (142.57 kg ha^{-1}), medium in available phosphorus (15.73 kg ha^{-1}), and high in potassium (242.23 kg ha^{-1}) with pH 8.3. The planting was done on 3rd November 2019. Among the various irrigation scheduling and potato varieties measure, Kufari Khyati irrigated with No Water Stress recorded higher in terms of growth and yields.

Keywords: Varieties of potato, irrigation scheduling, growth, plant height, number of haulm, tuber yield and yields

Introduction
The potato is a starchy tuber of the plant *Solanum tuberosum* and is a root vegetable native to the Americas, with the plant itself being a perennial in the nightshade family Solanaceae. Potatoes were introduced from the Americas to Europe in the second half of the 1+6th century by the Spanish. Now a dayds potatoes are a staple food in many parts of the world and an integral part of much of the world's food supply. As of 2014, potatoes were the world's 4th largest food crop after maize, wheat, and rice. A typical raw potato is 79% water, 17% carbohydrates (88% is starch), 2% protein, and contains negligible fat (see table) according to the United States Department of Agriculture. In a 100-gram (3½-ounce) portion, raw potato provides 322 kilojoules (77 kilocalories) of food energy and is a rich source of Vitamin B6 and Vitamin C (23% and 24% of the Daily Value, respectively), with no other vitamins or minerals in significant amount (see table). The potato is rarely eaten raw because raw potato starch is poorly digested by humans. When a potato is baked, its contents of vitamin B6 and vitamin C decline notably, while there is little significant change in the amount of other nutrients. The cultivated area is about 2.7 million hectares irrigated by surface irrigation from total cultivated area of 3.9 million hectares according to data issued by Ministry of Agriculture, Egypt in 2013. Despite this progressive water shortage farmer continue to use surface irrigation. Poor management, uniformity and distribution of water have been cited as the most frequent problems of surface irrigation, resulting in waterlogging, salinization and less water use efficiency (Abou Kheira, 2009) [1]. Potato is considered one of the main important vegetable ranks as manufacture and export crop among the different vegetable crops in Egypt. About 178 thousand hectares are only cultivated in spring and winter seasons. Total production of potato in Egypt is about four million tons per year.
Irrigation scheduling is defined as deciding when to irrigate and how much water to apply. Several types of irrigation scheduling have been documented. Martin *et al*. (1990) classified methods of irrigation scheduling as belonging to one of two broad groups: soil water balance computations, and soil and/or crop monitoring techniques. Deficit irrigation lowers yield due to reduced leaf area and/or reduced photosynthesis per unit leaf area. (Van Loon, 1981) [9]

Wateris the vital source for crop production and is the most limiting factor in Indian agriculture.

Materials and Methods

A field experiment was conducted on the topic entitled "Effect of different varieties of potato on irrigation scheduling in terms of growth and yields." during the Rabi season of 2019-20 at Main Experiment Statin, Vegetable Research Farm, A. N D. University of Agriculture & Technology Kumarganj, Ayodhya. The treatment consisted of five potato varieties *viz*. K. Ashoka, K. Bahar, K. Neelkanth, K. Khyati,

K. Sadabahar, and two irrigation scheduling *viz*. No Water Stress and Water Stress. The experiment was conducted in Factorial RBD and replicated three times. The soil of the experimental field was low in organic carbon (0.40%) and nitrogen (142.57 kg ha^{-1}), medium in available phosphorus (15.73 kg ha^{-1}), and high in potassium (242.23 kg ha^{-1}) with pH 8.3. The planting was done on 3rd November 2019.

Results and Discussion

Growth Characters

Initial plant emergence

Data pertaining to plant emergence in percent recorded at 30 Days After Planting (DAP), have been presented in Table 4.1 clearly indicated that the plant emergence percent did not influenced significantly due to varieties of potato and irrigation scheduling.

Plant height

Data pertaining to plant height recorded at 30 and 60 DAP as influenced by different experimental treatments have been presented in Table 1. A perusal of the data reveal that the irrigation scheduling and varieties of potato could produce variation on this attribute.

Varieties of potato influenced the plant height significantly at 30 and 60 DAP. Higher plant height at harvest 56.20 cm was recorded in K. Khyati which was at par with K. Sadabahar while significant over the rest of the varieties.

Critical analysis of data revealed that irrigation scheduling has no significant effect on plant height at 30 DAP. At later stage of plant growth, the higher plant height was recorded 46.40 cm and 51.26 cm at 60 DAP respectively was recorded with no moisture stress which was significantly superior over water stress.

Plant height at 60 was influenced significantly due to irrigation scheduling except 30 at DAP. Significantly higher value for plant height was recorded with I1 (no water stress) irrigation scheduling in comparison to I2 (water stress) Irrigation scheduling (Table 1). This may be due to optimum moisture which has boosted the vegetative growth. Similar findings have also been reported by Vanloon, 1981 [9] and Patel and Patel, 2001 [6].

Table 1: Initial Plant emergence and plant height at successive stage of potato as influenced by irrigation scheduling and varieties.

Treatments	Initial plant emergence (%) at 30 DAP	Plant height (cm)	
		30 DAP	60 DAP
Varieties			
K. Ashoka	92.10	20.85	42.90
K. Bahar	90.90	18.50	39.60
K. Neelkanth	92.50	19.00	46.85
K. Khyati	94.35	22.90	51.10
K. Sadabahar	90.00	17.60	39.60
S.Em+	2.59	0.56	1.02
CD at 5%	NS	1.68	3.03
Irrigation scheduling			
No Water Stress	92.14	19.86	46.40
Water Stress	91.80	19.48	41.62
S.Em+	2.24	0.49	0.88
CD at 5%	NS	NS	2.63

Number of leaves (m^{-1})

Data pertaining to number of leaves m^{-1} recorded at 30 and 60 DAP as influenced by irrigation scheduling and potato varieties have been presented in Table 2.

Critical analysis of results revealed that the potato varieties had significant effect on the number of leaves m $^{-1}$ at all the crop growth stages i.e. 30 and 60 DAP, significantly higher number of leave were recorded in K. Khyati variety as compared to rest of varieties

However, significant difference in number of leaves was recorded with different potato varieties and higher number of leaves m^{-1} i.e. 134.00 and 360.00 at 30 and 60 DAP was recorded in with K. Khyati which was significantly higher than K. Ashoka, K. Bahar, K. Neelkanth and K. Sadabahar.

Irrigation scheduling brought significant effect on the number of leaves at 60 DAP. Significantly higher number of leaves m^{-1} 331.60 at 60 DAP were recorded under no water stress which was superior over water stress (Table- 2).

It may be due to optimum supply of moisture which has boosted the vegetative growth. Optimum Irrigation has also produced more number of leaves. Similar findings have also been reported by Vanloon, 1984 and Patel and Patel, 2001 [9, 6].

Table 2: Number of haulms and number of leaves of potato as influenced by irrigation scheduling and varieties

Treatments	Number of haulms (m^{-1})	
	30 DAP	60 DAP
Varieties		
K. Ashoka	13.50	22.75
K. Bahar	15	25
K. Neelkanth	16	27
K. Khyati	17.25	27.50
K. Sadabahar	15.25	25.75
SEm+	0.36	0.59
CD at 5%	1.08	1.77
Irrigation scheduling		
No Water Stress	15.90	26.60
Water Stress	15	25
S.Em+	0.31	0.51
CD at 5%	NS	1.53

Yield attributes and yield

Number of 0-25 g grade tubers

Data pertaining to number of 0-25 g grade tubers hill^{-1} as affected by irrigation scheduling and potato varieties have been presented in Table 2.

There was significant difference in number of 0-25 g grade tubers hill^{-1} between different potato varieties. Higher number of 0-25 g grade tubers 34.5 hill^{-1} was recorded in K. Sadabahar which was at par with K. Bahar while significant over rest of the varieties of potato.

The number of 0-25 g grade tubers hill^{-1} was not affected significantly due to irrigation scheduling.

Number of 50-75 g grade tubers

Data pertaining to number of 50-75 g grade tubers hill^{-1} as affected by irrigation scheduling and potato varieties have been presented in Table 2.

Significant differences in number of 50-75 g grade tubers hill^{-1} was recorded with various potato varieties K. Khyati. Higher number of 50-75 g grade tubers (16 hill^{-1}) which was significantly superior over rest of the varieties.

The tuber with the number of 50-75 g hill^{-1} was influenced significant due to irrigation scheduling's. Higher number of 50-75 g grade tubers hill^{-1} was recorded under no water stress I1 with 12 hill-1 which was significantly superior over water stress I2.

Table 3: Number of tuber (hill^{-1}) of potato as influenced by irrigation scheduling and varieties

Treatments	Number of tuber (hill^{-1})	
	(0-25 g)	(50-75 g)
Varieties		
K. Ashoka	22.00	8.00
K. Bahar	33.00	10.00
K. Neelkanth	30.50	12.50
K. Khyati	34.50	16.00
K. Sadabahar	18.00	9.50
S.Em+	0.79	0.25
CD at 5%	2.35	0.76
Irrigation scheduling		
No Water Stress	27.20	12.00
Water Stress	28.00	10.40
S.Em+	0.68	0.22
CD at 5%	NS	0.66

Tubers yield

Tuber yield (qha^{-1}) as influenced by various irrigation scheduling and potato varieties have been presented in Table 4.8 and graphically depicted in Fig. 4.13.

Result showed that the potato varieties significantly affects the tuber yield. Higher tuber yield 408.10 qha^{-1} was recorded under potato variety V4 (K. Khyati) which was significantly superior over rest of the potato varieties.

Results also showed significant difference in tuber yield among both irrigation scheduling. Irrigation scheduling no water stress (I1) recorded significantly higher tuber yield 361.14 qha^{-1} as compared to irrigation scheduling with water stress I2 310.6 qha^{-1}.

Table 3: Tuber yield (t ha^{-1}) of potato as influenced by irrigation scheduling and varieties

Treatments	Tuber yield (qha^{-1})
Varieties	
K. Ashoka	274.70
K. Bahar	311.70
K. Neelkanth	366.75
K. Khyati	408.10
K. Sadabahar	316.60
S.Em+	7.22
CD at 5%	21.46
Irrigation scheduling	
No Water Stress	361.14
Water Stress	310.6
S.Em+	6.25
CD at 5%	18.59

Conclusion

Among Different irrigation scheduling practices we recorded that the potato variety Khufari Khyati Irrigated with no water stress give highest production.

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