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Short Communication

Effect of NPK levels on yield, quality and nutrient uptake of watermelon (C*itrullus lanatus* Thunb.) var. Sugar Baby

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Watermelon (C*itrullus lanatus* Thunb.) is an important cucurbitaceous crop, and an excellent dessert fruit and its juice is a very good refreshing drink. This crop is mainly grown in major river beds of U.P. Rajasthan, Gujarat, Maharashtra and Andhra Pradesh. Watermelon is an emerging crop in Assam with high market demand. The crop is cultivated in a meager area of Assam. Due to lack of information regarding proper production technology, the farmers of this region do not come forward to take up its cultivation as commercial venture. Among the different factors influencing the optimization of crop yield, nutrient management is one of those factors. Organic manures alone cannot suffice the major plant nutrient requirement of the crop. Therefore, organic manures along with inorganic plant nutrient such as N, P and K were applied in different levels to standardize the nutrient requirement for growth, yield and quality of watermelon. As there was not much literature available regarding the nutrient requirement of the crop, hence in view of this perspective an experiment was conducted to standardize the nutrient requirement of the crop.

An experiment was conducted in the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during 2009. The soil of the experimental plot was sandy loam with pH 6.5 and the available nitrogen, phosphorus and potassium were 295.00, 40.82 and 114.05 kg/ha, respectively. The experiment comprising seven treatments was laid out in Randomized Block Design with three replications. The observations in respect to growth and yield attributing characters were recorded and the quality parameters of fruit were determined as per standard procedures. Fifty percent of nitrogen in the form of urea, full dose of phosphorus in the form of single super phosphate and full dose of potassium in the form of muriate of potash were applied as per the treatment in the furrows at about four days before transplanting and mixed with the soil. The remaining 50 per cent of nitrogen was applied in at 30 days after transplanting i.e. at the time of earthing up. The treatment details are given below:

T_0=control, T_1=50:35:50 NPK kg/ha, T_2=60:40:60 NPK kg/ha, T_3=70:45:70 NPK kg/ha,

T_4=80:50:80 NPK kg/ha, T_5=90:55:90 NPK kg/ha and T_6=100:60:100 NPK kg/ha

Table 1 reveals that yield was influenced by the application of fertilizers. The highest yield (356.67q / ha) was recorded in the treatment T5 (90:55:90kg NPK/ ha) which was closely followed by 333.50q in T6 (100:60:100kg NPK/ha). This might be due to cumulative effect of higher number of fruit per plant and higher average fruit weight. The increase in the number of fruits and average fruit weight could be attributed to the ability of NPK to promote vigorous growth, increase meristematic and physiological activity in the plant due to supply of nutrient and improvement in the soil properties, thereby resulting in the synthesis of more assimilates, which are used in producing fruits (John *et.al*, 2004)

The highest TSS of 9.30% was exhibited in T6, which was at par with T5 (9.25%), this might be due to substantial increase in production and accumulation of photosynthates within the plant and more conversion of organic acid to sugar. The higher TSS may also be due to functioning of number of enzymes with a better support to physiological processes which probably resulted an increase in TSS of fruit. It was also observed from the table that sugar content was increased linearly with the increased level of fertilizer doses upto a level after that further increased in fertilizer level showed decreasing trend in sugar content. The highest total sugar (7.62%) was recorded in the treatment T5. Potash has the tendency to augment total sugar. Berezhnova and Agzamova (1976) found that K_2O at high dose (100kg/ ha) augmented the sugar content in two cultivars of

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melons. A gradual increase in dry matter content and nutrient uptake in the plant was observed with increased levels of NPK doses as well as with the advancing age of the plant (or growth stage). The result corroborates the finding of the Groen and Slegen (1990). At vegetative stage, uptake of the plant was minimum even though the nutrient content was maximum and at flowering and early fruit setting stage, uptake of nutrient (i.e. N,P and K) by the plant was maximum even though the nutrient content was minimum (Table 3).

The increased nitrogen uptake due to higher levels of fertilizer application in present study could be attributed to increased availability of nutrient at higher level and increased dry matter production. Phosphorus uptake by watermelon plant was significantly influenced by fertilizer levels. It could be attributed to the fact that the phosphorus is the constituent of many metabolically active components in the plants like nucleic acids, phytins, phospholipids, sugar phosphates and plays a key role in energy metabolism. Further phosphorus promotes rapid early growth and accelerates the development of more prolific flowering and increased yield (Shanmugvalu, 1989).

Potassium uptake was found more because potassium activates numerous enzymes like pyruvic kinase, cytoplasmic enzymes and therefore, causes pervasive effects on metabolic events. Potassium is involved in the movement of carbohydrate, accumulation of carbohydrates and soluble nitrogenous compounds. Further increased uptake of potassium at high level of fertilizer may be due to increased dry matter accumulation at higher levels. Comparative economics

Table 1. Effect of NPK on yield parameters of watermelon var. Sugar Baby

Treatment	Fruits per vine	Weight /fruit (kg)	Yield per vine (kg)	Yield per hectare (q)	Increase percentage over control
T_0 (0:0:0)	0.92	2.98	3.46	86.42	-
T_1 (50:35:50)	1.35	3.19	4.31	107.75	24.68
T_2 (60:40:60)	1.44	3.43	4.92	123.00	42.33
T_3 (70:45:70)	1.69	4.71	7.97	199.33	130.65
T_4 (80:50:80)	1.98	4.98	9.85	246.33	185.04
T_5 (90:55:90)	2.43	5.91	14.31	357.67	313.87
T_6 (100:60:100)	2.27	5.86	13.34	333.50	285.91
S.Ed±	0.19	0.17	1.06	26.56	-
C.D(5%)	0.42	0.37	2.32	57.88	-

Table 2. Effect of NPK on quality parameters of watermelon var. Sugar Baby

Treatment	Juice content (%)	TSS (%)	Ascorbic acid (mg/100g)	Acidity (%)	Total sugar (%)
T_0 (0:0:0)	81.53	8.16	4.36	1.42	6.58
T_1 (50:35:50)	82.58	8.32	4.73	1.20	6.77
T_2 (60:40:60)	84.00	8.40	4.80	1.18	6.79
T_3 (70:45:70)	87.33	8.56	4.89	1.18	6.88
T_4 (80:50:80)	88.82	8.77	4.93	1.15	7.61
T_5 (90:55:90)	90.80	9.25	5.14	1.15	7.62
T_6 (100:60:100)	91.00	9.30	5.13	1.13	7.53
S.Ed±	0.39	0.03	0.03	0.02	0.02
C.D (5%)	0.84	0.07	0.06	0.04	0.04

Table 3. Effect of levels of NPK application on nitrogen, phosphorus and potassium content of the plant

Treatment	Nitrogen content (%)		Phosphorus content (%)		Potassium content (%)	
	Vegetative stage	Flowering and early fruit setting stage	Vegetative stage	Flowering and early fruit setting stage	Vegetative stage	Flowering and early fruit setting stage
T_0 (0:0:0)	2.42	1.98	0.18	0.16	3.15	2.75
T_1 (50:35:50)	3.97	3.00	0.26	0.25	4.60	3.35
T_2 (60:40:60)	4.25	3.04	0.28	0.27	4.72	3.80
T_3 (70:45:70)	4.30	3.04	0.29	0.27	4.85	3.90
T_4 (80:50:80)	4.32	3.05	0.32	0.29	5.00	4.10
T_5 (90:55:90)	4.40	3.12	0.35	0.31	5.10	4.85
T_6 (100:60:100)	4.32	3.08	0.33	0.30	5.10	4.35
S.Ed±	0.01	0.02	0.02	0.01	0.09	0.06
C.D(5%)	0.03	0.04	0.04	0.03	0.19	0.14

Table 4. Effect of levels of NPK application on nitrogen, phosphorus and potassium uptake by the plant

Treatment	Nitrogen		Phosphorus		Potassium	
	Vegetative stage	Flowering and early fruit setting stage	Vegetative stage	Flowering and early fruit setting stage	Vegetative stage	Flowering and early fruit setting stage
T_0 (0:0:0)	3.11	4.94	0.25	0.37	4.33	6.23
T_1 (50:35:50)	5.75	8.51	0.48	0.56	6.42	9.86
T_2 (60:40:60)	6.75	10.98	0.59	0.72	8.44	12.19
T_3 (70:45:70)	7.42	13.65	0.66	0.92	9.51	15.40
T_4 (80: 50:80)	7.49	14.19	0.71	1.05	10.08	16.43
T_5 (90:55:90)	11.19	20.55	1.11	1.87	17.39	21.39
T_6 (100:60:100)	10.36	18.96	1.01	1.45	14.64	20.18
S.Ed±	0.02	0.04	0.03	0.02	0.02	0.07
C.D(5%)	0.05	0.09	0.06	0.04	0.05	0.15

Table 5. Economics of production

Treatment	Yield (q/ha)	Gross return (Rs)	Total cost of cultivation (Rs)	Net return (Rs)	Cost benefit ratio
T_0 (0:0:0)	86.42	69,136.00	37,856.00	31,280.00	1 : 0.83
T_1 (50:35:50)	107.75	86,200.00	42,059.94	44,140.06	1 : 1.05
T_2 (60:40:60)	123.00	98,400.00	42,601.73	55,798.27	1 : 1.31
T_3 (70:45:70)	199.33	159,464.00	43,143.52	116,320.48	1 : 2.69
T_4 (80:50:80)	246.33	197,064.00	43,685.30	153,378.70	1 : 3.51
T_5 (90:55:90)	357.67	286,136.00	44,227.09	241,908.91	1 : 5.47
T_6 (100:60:100)	333.50	266,800.00	44,768.88	222,031.12	1 : 4.96

of different treatments revealed that there was profound effect of different levels of applied nutrient on net return and cost benefit ratio of cultivation of watermelon (Table 5). Among the different treatments T5 recorded the highest cost benefit ratio of 1: 5.47, while the lowest of 1: 0.83 was recorded under control (T0)

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