Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2021; 10(1): 2011-2014
Received: 17-11-2020
Accepted: 26-12-2020

Salman Wadi Mohammed
Research Student, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

Sudhir Kumar Mishra
Research Scholar, Department of Horticulture, National Post Graduate Collage, Barhalganj, Gorakhpur, Uttar Pradesh, India

Rohit K Singh
Research Scholar, Department of Horticulture, I.Ag.S. (BHU), Varanasi, Uttar Pradesh, India

Manish Kumar Singh
Research Scholar, Department of Horticulture, I.Ag.S. (BHU), Varanasi, Uttar Pradesh, India

Shiv Shankar Soni
Assistant Professor, Department of Agricultural Statistics, National Post Graduate Collage, Barhalganj, Gorakhpur, Uttar Pradesh, India

Corresponding Author:
Manish Kumar Singh
Research Scholar, Department of Horticulture, I.Ag.S. (BHU), Varanasi, Uttar Pradesh, India

The effect of NPK on the growth, yield and quality of cucumber (*Cucumis sativus* L.) under protected cultivation

Salman Wadi Mohammed, Sudhir Kumar Mishra, Rohit K Singh, Manish Kumar Singh and Shiv Shankar Soni

Abstract
The experiment was carried out in vegetable Research Farm, during November- 2011 to April-2012 with following combination of NPK which was T_1 (control), T_2 (100:60:60), T_3 (100:60:120), T_4 (100:120:60), T_5 (100:120:120), T_6 (150:60:60), T_7 (150:60:120), T_8 (150:120:60) and T_9 (150:120:120) kg ha^{-1}. The cultivar of cucumber was F_1 Hybrid "Nice Slice" from Known-you seed (India) Pvt. Ltd. this was a partherocarpic cucumber cultivar. The highest plant height (256.67 cm), appearance of first male flower 28 days, appearance of first female flower 30 days, number of male flowers per plant (13), number of female flowers per plant (19.08), number of fruits per plant (13), fruit weight (179.67 gm), fruit yield (56.76), chlorophyll content (11.98 mg/g), T.S.S (6.63 ^{0}Brix) and highest organoleptical score was obtained in T_9(150:120:120 kg ha^{-1}). The maximum benefit cost ratio (3.74) was also obtained in T_9 treatment.

Keywords: *Cucumis sativus* L, T.S.S, fruit weight, yield and F_1 Hybrid "Nice slice"

Introduction
The cucumber (*Cucumis sativus* L.) belongs to the cucurbitaceae family, cucumber plants are monoecious – they produce both male and female flowers on the same plant. Male flowers appear on the main stem earlier and in much larger numbers than female flowers**.** Cucumis comprises agenus nearly 40 species Whitaker, T.W. and Devis, G. N. (1962) [27]. Many modern hybrids are gynoecious – they produce only female flowers and are referred as female verities. The crop is the fourth most important vegetable after tomato, cabbage and onion in Asia (Tatlioglu, 1997) [25], Cucumber requires large quantities of both macro and micro nutrients for required of economic yields of cucumber. Nitrogen, phosphate and potash nutrients are important and play a key role in the production of both quantity and quality level in cucumber. Cucumber plants should be fertilized with adequate dose of nitrogen. Phosphorus and potassium which are the main elements and effect on growth of plants.

Effect of nitrogen on vegetative and fruit yield is more obvious than other nutrients, as it promotes the setting of flower and fruits. Nitrogen is a part of all living cells and is a necessary part of all proteins, enzymes and metabolic processes involved in the synthesis and transfer of energy. Nitrogen is a part of chlorophyll, the green pigment of the plant that is responsible for photosynthesis. Nitrogen deficiency results in a heavy reduction in growth and yield. Majority of Indian soils are deficient in nitrogen and as such the crop grown on them responds very favorably to its applications. The growth of most the vegetable crops is influenced by nitrogen supply helps plants with rapid growth, increasing seed and fruit production and improving the quality of leaf and forage crops. Nitrogen deficiency causes stunted growth and accelerates flower dropping, while it's excess supply delays maturity and decreases fruit size.

Phosphorus (P) is an essential part of the process of photosynthesis. Involved in the formation of all oils, sugars and starches, Effects rapid growth, Encourages blooming and root growth Phosphorus has pronounced effect on cucumber plant. High level of available phosphorus throughout the root zone is essential for root development and good utilization of water and other nutrients by the plant. Potassium is absorbed by plants in larger amounts than any other mineral element except nitrogen and, in some cases, calcium helps in the building of protein, photosynthesis, fruit quality and reduction of diseases. The need of cucumber plants for potassium is much higher than other nutrient elements. Potassium has been found to improve the quality of cucumber fruits. Potassium is supplied to plants by soil minerals, organic materials, and fertilizer. K^+ and its accompanying anions make a major contribution to the osmatic potential of cell and tissues of the glycophytic plant species (Marshaner, 1995).

Keeping in the view role and importance of NPK the investigation was conducted find out suitable dose off their nutrients better production of cucumber in cultivation.

Materials and Methods

The present investigation entitled 'The effect of NPK on the growth, yield and quality of cucumber (*Cucumis sativus L.*) under protected cultivation' was carried out during winter season in the period of mid-November to mid-April the year 2011 at vegetable Research Farm, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, (Deemed-to-be-University) Allahabad (U.P.). The experiment was laid out in randomized block design with three replications and nine treatments.

Treatment details

T_1: No fertilizer (control)
T_2: (100:60:60 NPK kgha^{-1})
T_3: (100:60:120 NPK kgha^{-1})
T_4: (100:120:60 NPK kgha^{-1})
T_5: (100:120:120 NPK kgha^{-1})
T_6: (150:60:60 NPK kgha^{-1})
T_7: (150:60:120 NPK kgha^{-1})
T_8: (150:120:60 NPK kgha^{-1})
T_9: (150:120:120 NPK kgha^{-1})

An uniform basal of 20 tonnes/hectare well rotten farm yard manure was applied in per pit (45x45cm) applied before sowing of seeds. Nitrogen was applied in the farm of urea in two split dose out of which 1/2 at the time of planting 1/2 during flowering stage. Phosphorus and potassium were applied in the form of di-ammonium phosphate and murate of potash respectively at the time of sowing. The fertilizer as per treatments was applied in the pit thoroughly mixed in the soil with the help of weeding hoe.

Results and Discussion

The maximum plant height (256.67 cm) was recorded with T_9 (150kg N ha^{-1}: 120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}: 120kg P_2o_5 ha^{-1}: 60kg K_2o ha^{-1}) i.e. (247cm). However the minimum plant height was observed in T_1 (control) (141.67 cm). Higher plant height with combination of NPK may be attributable to the fact that nitrogen increases vigour of the plant and a constituent, enzymes and high energy bonds. The resulted reported Funamato and Masuda (1955) [6], Flacker *et al.* (1965),

The minimum days appearance of first male flower 28 days was recorded in T_9 (150kg N ha^{-1}: 120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}: 120kg P_2o_5 ha^{-1}: 60kg K_2o ha^{-1}) which was 28.67 days. While the maximum days to appearance of first male flower was recorded in T_1 (control), which was 32 days. The best result was reported by Sinikov *et al.* (1992) [22] and Haffman (1959) in capsicum and Eguchi (1961) [5] in tomato, eggplant and pepper, reported delayed flowering due to nitrogen deficiency.

The minimum days appearance of first female flower 30 days was recorded in T_9 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:60kg K_2o ha^{-1}) which was 30.33 days. While the maximum days to appearance of first male flower was recorded in T_1 (control), which was 36.33 days. This was observed by Niu *et al*. (2008) [17] and Hoffman (1959) [10] in capsicum and Eguchi (1961) [5] in tomato, eggplant and pepper, reported delayed flowering due to nitrogen deficiency.

The maximum number of male flower per plant (13) was recorded in T_9 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:60kg K_2o ha^{-1}) which was (12.25). While the minimum number of male flower per plant was recorded in T_1 (control), which was (6.17). Higher number of male flower per plant with combination of findings of Parik and Chandra (1970), Pandey and Singh (1989) [18], Srinivas and Doijode (1984) [23], and Aror and Siyag (1989) [1]. Similar results have also been by Brantley and Waren (1961) in watermelon. Similar results have also been reported by Khan *et al*. (2005) [3].

The maximum number of female flower per plant (19.83) was recorded in T_9 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:60kg K_2o ha^{-1}) which was (18.08). While the minimum number of female flower per plant was recorded in T_1 (control), which was (10.83). These results are in close conformity with the findings of Parik and Doijde (1984) and Arara and Siyag (1989) [1]. Similar results have also been reported by Brantley and Warren (1961) in watermelon. Similar results have also been reported by Khan *et al*. (2005) [3].

The maximum number of fruits per plant (13) was recorded in T_9 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:60kg K_2o ha^{-1}) which was (12). While the minimum number of fruits per plant was recorded in T_1 (control), which was (5.33). Similar results have been reported by Choudhari and more (2002) [4] and Ravikumar, *et al.* (2003) and Jilani *et al.* (2009) [12].

The maximum the fruit weight (179.67 gm) was recorded in T_9 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:60kg K_2o ha^{-1}) which was (178.67g). While the minimum the fruit weight (gm) was recorded in T_1 (control), which was (143.33gm). These results are also in agreements with those reported by Eysinga *et al*. (1982). Observed that K_2o application increased fruit size and weight in melons. Similar results have also been reported by Choudhari and More (2002) [4] and Khan *et al*. (2005) [3] and Niu *et al*. (2008) [17] and Jilani *et al*. (2009) [12].

The maximum fruit yield (56.76 t ha^{-1}) was recorded in T_9 (150kg N ha^{-1}: 120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}: 120kg P_2o_5 ha^{-1}: 60kg K_2o ha^{-1}) which was fruit yield (52.11 t ha^{-1}). While the minimum fruit yield (t ha^{-1}) was recorded in T_1 (control), which was (18.58 t ha^{-1}). Increase in the yield due to higher levels of nitrogen application has been reported by Jassal *et al*. (1970) [11], Randhawa *et al*. (1981) [19], Deswal and Patil (1994), and Singh and Chhonker (1986). Arora and Siyag (1988) [1] reported that in both the season N and P gave maximum fruit yield per hectare. Sutton (1966) [24] and Pelaez *et al*. (1984) who reported beneficial effect of potassium application on yield of squash. Hassan *et al*. (1986) [9] reported positive yield response with K application in melons. Similar result have also been reported by Sinikow *et al*. (1992) and Khristov and Ranlov (1992) [15] and Choudhari and More (2002) [4] and Bindiya *et al*. (2006) [2].

9-The maximum chlorophyll content (11.98 mg/g) was recorded in T_9 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:120kg K_2o ha^{-1}) followed by T_8 (150kg N ha^{-1}:120kg P_2o_5 ha^{-1}:60kg K_2o ha^{-1}) which was chlorophyll content (10.13 mg/g). While the minimum chlorophyll content (mg/g) was recorded in T_1 (control), which was 4.66. The similar result was observed by Uamaheswarappa *et al*. (2005-2006) application of various levels of nitrogen had significant effect on chlorophyll a, b and total chlorophyll in leaf. During both year.

Table 1: Effect of NPK on growth, flowering and number of fruits per plant under different treatments of cucumber (*Cucumis sativus* L.)

Treatment No.	Treatment	Plant height	First male flower initiation	First female flower initiation	Number of male flowers per plant	Number of female flowers per plant	Number of fruits per plant
T_1	Control	141.67	32.00	36.33	6.17	10.83	5.33
T_2	N:P:K @ 100:60:60 kg ha^{-1}	188.67	31.00	35.00	9.50	14.50	6.25
T_3	N:P:K @ 100:60:120 kg ha^{-1}	196.67	30.33	33.67	10.00	15.08	7.00
T_4	N:P:K @ 100:120:60 kg ha^{-1}	206.67	30.00	33.33	10.92	15.42	7.33
T_5	N:P:K @ 100:120:120 kg ha^{-1}	210.00	29.67	32.67	11.00	15.50	8.25
T_6	N:P:K @ 150:60:60 kg ha^{-1}	225.00	29.33	32.00	11.67	16.00	9.00
T_7	N:P:K @ 150:60:120 kg ha^{-1}	235.00	29.00	30.67	12.00	17.25	10.67
T_8	N:P:K @ 150:120:60 kg ha^{-1}	247.00	28.67	30.33	12.25	18.08	12
T_9	N:P:K @ 150:120:120 kg ha^{-1}	256.67	28.00	30.00	13.00	19.08	13
	F – test	S	S	S	S	S	S
	S. Ed. (±)	3.62	0.27	0.29	0.12	0.12	0.16
	C. D. (P = 0.05)	7.67	0.58	0.61	0.24	0.26	0.33

Table 2: Effect of NPK on yield and chlorophyll content of fruits under different treatments of cucumber (*Cucumis sativus* L.)

Treatment No.	Treatment	Fruit weight (g)	Fruit yield (tha^{-1})	Chlorophyll content (mg/g)
T_1	Control	143.33	18.58	4.66
T_2	N: P: K @ 100 : 60:60 kg ha^{-1}	147.00	22.33	6.52
T_3	N: P: K @ 100 : 60: 120 kg ha^{-1}	147.67	25.12	7.25
T_4	N: P: K @ 100 : 120: 60 kg ha^{-1}	163.33	29.11	7.92
T_5	N: P: K @ 100 : 120: 120 kg ha^{-1}	164.00	32.88	8.36
T_6	N: P: K @ 150 : 60: 60 kg ha^{-1}	166.00	36.30	9.09
T_7	N: P: K @ 150 : 60: 120 kg ha^{-1}	171.67	44.50	9.69
T_8	N: P: K @ 150 : 120: 60 kg ha^{-1}	178.67	52.11	10.13
T_9	N: P: K @ 150 : 120: 120 kg ha^{-1}	179.67	56.76	11.98
	F – test	S	S	S
	S. Ed. (±)	0.44	0.70	0.19
	C. D. (P = 0.05)	0.93	1.49	0.41

Conclusion

Based on the result of experiment. it may be concluded that the treatment T_9 (150:120:120 kg ha^{-1}) NPK was recorded the best among in all combination of NPK in term of growth and yield attribute parameter and also increase the (T.S.S.) and (vit. C) but slightly effect on colour, texture, taste, aroma and flavor. The T_9 was obtained the highest cost benefit ratio (3.74).

Reference

1. Arora SK, Siyag Satish. Effect of nitrogen (N) and Phosphorous (P) on fruit yield and quality of sponge gourd (*Luffa cylindrical* L.) C.V. Pusa Chikani Crop Res. (Hissar) 1989;2(1):26-29.
2. Bindiya Y, Reddy IP, Srihari D, Narayanamma M, Reddy RS. Effect of integrated nutrient management on growth and yield of cucumber (*Cucumis sativus* L.). J Res. ANGRAU 2006;34(4):8-1.
3. Brantly BB, Warren GF. Effect of nutrition on flowering, fruiting and quality of watermelon. Proc. Amar. Soc. Hort. Sci 1961;75:644-53.
4. Choudhari SM, More TA. Fertigation, fertilizer and spacing requirement of tropical gynoecious cucumber hybrids. Acta Hort 2002;588:233-240.
5. Eguchi T, Matsumura T, Ashizawa M. Studies on the effect of nutrition on flower formation in vegetable crops. Bul. Nat. Isnt. Sci Hiratasuka, ser, E. No 1961, P7.
6. Funamato H, Masuda S. Studies on factorial application of nitrogenous fertilizers in vegetable crops III-cucumbers. J Hort. Ass. Japan 1965;24:62-68.
7. Flocker WJ, Lingle JC, Davis RM, Miller RJ. Influence of irrigation and nitrogen fertilization on yield quality and size cantaloupes. Proc. Amer. Soc. Hort. Sci 1965;86:424-32.
8. Gopalan C, Rama Satri BV, Balasubramanian SC. Nutritive value of Indian Food. Indian Council of Medical Res. National Institute of Nutritive, Hyderabad 1982.
9. Hassan MA, Sasidhar VK, Peter KV. Effect of graded dose of nitrogen, phosphorus and potassium on growth and yield of oriental picking melon (Cucumis melon var. conomon). Agric. Res. J Kerala 1984;22(1):43-47.
10. Hoffman JC. The effect of carbohydrates and N of deficiency upon growth, flowering, fruit setting and development of the male and female gametophytes of pepper (*Capscicum feutescens L.*) Diss. Abstr 1959;18:744-46.
11. Jassal NS, Randawa KS, Nandpuri. A study on the effect of irrigation and certain does of N, P and K on the weight of fruit and yield of muskmelon. Punjab Hort J 1970;10:143-149.
12. Jilani MS, Abu Bakar KW. Effect of different levels of NPK on the growth and yield of cucumber (*Cucumis sativus*) under the plastic tunnel. J. Agric. and Soc. Sci 2009;5(3):99-101.
13. Khan AU. Muhammad Subhan Khan AU, Khan Bahader. Effect of NPK alone and in combination on the growth and yield of cucumber. Indus J plant Sci 2005;4(4):428-431.
14. Kurup SS, Al-Auraifan S, Al-Hunaidi M, Al-Salem SM, Al-Khabbas SA, Al-Sumei WA, Al-Gullaf GA. Response of cucumber (*cucumis sativus L.*) to different levels of NPK fertilizers under soilless culture. Indian J Agric. Res 2011;45(2):134-139.
15. Khristov B, Rankov V. Effect of the date mineral fertilizer application on the productivity and of biological removal of nutrient by melons. [Bulgarian]

Pochvoznanie, Agrokhimiyay Ekologiya 1992;27(3-4):41-45.
16. Marschner H. Mineral nutrition of higher plants. 2. ed. London, Academic Press 1995, P889.
17. Niu Zai-Lie, Liu Jian-hui, Du Jun-zhi, Si Li-zheng. Effect of different amount of nitrogen and potassium on yield and quality of musk melon. (College of Hort. Northwest Agri. And Foresty Unvi. Yangling, Shaanxi, 7121100 China 2008.
18. Pandey RP, Singh K. Note on the effect of nitrogen and maleic hydrazide on sex expression, sex ratio and yield of bottle gourd. Indian J Agri. Sci 1973;43(3):882-883.
19. Randhawa KS, Cheema DS, Sandhu DS. The effect of nitrogen, phosphorous and potassium on the growth, yield and quality of new muskmelon varieties. Haryana J Hort. Sci 1981;10(1/2):88-94.
20. Shanmugasundaram S. Vegetable Surmountate challenges. The Hindu Survey of Indian Agriculture, M/S Kasturi and Sons Led, Chennai 2001, P126-127.
21. Singh DN, Chhonkar VS. Effect of nitrogen, phosphorus, potassium and spacing on growth and yield of muskmelon (*Cucumis melo* L.) Indian J Hort 1986;43(3/4):265-269.
22. Sinikov D, Mukhammedov A, Baisakhatov R. Effect of fertilization on the productivity of the melon cultivar Vakharman-499 in Tedzhensk region. [Russian] Izvestiya Akademii Nauk Turkmenistana. Seriya Bioloogicheskih Nauk 1992;3:17-22.
23. Srinivas K, Prabhakar BS. Response of muskmelon (*Cucumis melo L.*) to varying levels of spacing and fertilizers. Singapore J Primary Industries, Singapore, v. 1984;12:56-61.
24. Sutton P. Effect of nitrogen, phosphorus and potassium on squash yield. Proc. Soil. Sci. Fla 1966;25:46-50.
25. Tatlioglu T. Cucumber (*Cucumis sativus* L.) In: Kailov, G and Bo Bergn, (eds.). Genetic improvement of vegetable crops. Oxford Pergamon Press 1997, P197-227.
26. Umamaheswarappa P, Gowda VN, Murthy PV, Krishnappa KS. Nutrients uptake by cucumber (*Cucumis Sativus* L.) cv. Poinsette as affected by varying levels of nitrogen, phosphorus and potassium in eastern dry zone of Karnataka. J Asian Hort 2005/2006;2(1/2):99-103.
27. Whitaker TW, Devis GN. Cucurbits. Inters Sci., New York 1962, P250.