JOURNAL OF AGRICULTURE & SOCIAL SCIENCES
ISSN Print: 1813–2235; ISSN Online: 1814–960X
09–012/AWB/2009/5–3–99–101
http://www.fspublishers.org

Full Length Article

Effect of Different Levels of NPK on the Growth and Yield of Cucumber (*Cucumis sativus*) Under the Plastic Tunnel

MUHAMMAD SALEEM JILANI, ABU BAKAR, KASHIF WASEEM[1] AND MEHWISH KIRAN
Department of Horticulture, Faculty of Agriculture, Gomal University, Dera Ismail Khan, Pakistan
[1]Corresponding author's e-mail: waseem_hort@yahoo.com; waseemhort@gmail.com

ABSTRACT

An experiment was conducted to check the effect of different levels of NPK on the growth and yield of hybrid cucumber. Application of NPK fertilizer (100-50-50) showed the best performance in almost all the parameters studied, as it took least days to flowering (39.33), fruit setting (11.55), maturity (7.88), maximum fruit per plant (35.5), maximum fruit length (18.36 cm), maximum fruit weight (136.03 g) and yield per hectare (60.02) tons. Application of NPK fertilizers @ 120-60-60 kg ha^{-1} also showed some beneficial effect on some parameters including fruit weight (150.69 g) and vine length (3.85 m). Control plots showed un-satisfactory results regarding all the parameters.

Key Words: Cucumber; NPK; Plastic tunnel; Flowering; Fruit; Yield

INTRODUCTION

Cucumbers (*Cucumis sativus* L.) are high yielding but frost-sensitive vegetables. They give satisfactory yield as an early-season crop and well during the summer and fall. In addition to its palatability and fairly good caloric value, it is reported to be high important to human for its medicinal value. It is very useful for natural Diuretic and thus can serve active drug for secreting and promoting the flow of urine. A total area of 1108 hectare with an average production of 5.85 ton ha^{-1} with total production of 6487 tons was recorded in Pakistan in 2005-06 (Anonymous 2006). Although it is one of the major vine crop grown in Pakistan, its yield is quiet low. Increase in cucumber production can be achieved either bringing more area under its cultivation, or by adopting improved varieties and better cultural practices. The second approach is more often preferred and among various cultural practices fertilizer application is one of the quickest and easiest ways of increasing the yield per unit area under cucumber.

Although, it is one of the most important summer vine vegetable crop, used extensively in some areas under plastic tunnels (vegetable forcing) for very early production to capture best prices. Cucumber has been rated suitable for greenhouse cultivation in comparison with traditional agricultural practices (El-Amir *et al.*, 2001). It is the most important greenhouse crop. Commercial production of cucumbers and other vegetables has increased steadily under green house as compare to severe climate (El-Aidy, 1992).

Rubeiz (1990) observed that response of cucumber plants to NPK at the rate of 200:85:150 (per hectare) was substantially higher than the control. Rehamn *et al.* (1995) observed that NPK@ 140-60-150 kg ha^{-1} exhibited better results for highest germination percentage, more fruits per vine, maximum fruit diameter and weight, vine length and total yield. However, days to flowering, fruit setting and maturity were delayed. Phu (1996) reported that N and K fertilizer applications had significant effect on the yield of cucumber variety Poung. Nitrogen and Potassium rate at 100–100 kg ha^{-1} gave promising for number of fruits, main stem length, number of branches and yield. Choudhari and More (2002) applied 150:90:90 kg NPK ha^{-1} through fertigation and found maximum number of fruits per vine, fruit weight (g), yield per plant (kg) and yield ha^{-1} (tons) of cucumber plant. Naeem *et al.* (2002) reported that different dozes of NPK were significant different for days to flowering, days to fruiting, number of branches per plant, plant height (cm), number of fruits per plant, length of fruit (cm) and total yield (kg ha^{-1}). Abdel-Mawgoud *et al.* (2005) reported that increasing the level of NPK resulted in a positive response in the vegetative growth and increased pod yield. Watcharasak and Thammasak (2005) found that fertigation of 150 mg N L^{-1} gave the highest leaf number, leaf area, fresh and dry weight of shoot and roots, in cucumber. Ahmed *et al.* (2007) reported that an increase in nitrogen application resulted in maximum fruit length, fruit weight, vine length and yield of cucumber. Din *et al.* (2007) reported that NPK level of 120-90.60 kg ha^{-1} significantly performed better with regard to head weight, head diameter, head length, marketable yields and head yield of cabbage.

Jilani *et al.* (2008) reported that nitrogen application @ 100 kg ha^{-1} produced significantly maximum survival percentage, fruit length, fruit diameter, fruit volume, fruit

To cite this paper: Jilani, M.S., A. Bakar, K. Waseem and M. Kiran, 2009. Effect of different levels of NPK on the growth and yield of cucumber (*Cucumis sativus*) under the plastic tunnel. *J. Agric. Soc. Sci.*, 5: 99–101

weight and yield per hectare in brinjal. Waseem *et al.* (2008) also reported that 100 kg N ha^{-1} had significantly maximized cucumber fruit length, fruit weight and vine length, which are indirectly related to the yield, but 80 kg N ha^{-1} was the most economical dose for minimizing the days to flowering, days to fruit setting and days to fruit maturity and getting higher number of fruits and ultimately higher yield. The present research work was undertaken to study the effect nitrogen, phosphorus and potassium level on the growth and yield of cucumber grown under plastic tunnels.

MATERIALS AND METHODS

The experiment was conducted at Ali Vegetable farm (Multan Chemicals Limited, Multan, Pakistan) during winter 2006-2007. The experiment was laid out in randomized complete block design (RCBD) having five levels of NPK, including control and all the treatments were replicated thrice. Seeds of cucumber hybrid (Noble) were sown on flat bed in high plastic tunnel. Nitrogen (urea) was given in split doses. First dose was applied after full germination, while the remaining dose was applied 30 days after the first dose. P and K were applied at the time of soil preparation. Different treatments of NPK were (Control) no NPK applied, 60-30-30 NPK kg ha^{-1}, 80-40-40 NPK kg ha^{-1},100-50-50 NPK kg ha^{-1} and 120-60-60 NPK kg ha^{-1}.

All cultural practices i.e., irrigation, hoeing and weeding were carried out throughout the growing season as recommended. The data was recorded for days taken to flowering, days to fruit setting, days to fruit maturity, number of fruit per plant, fruit length (cm), fruit weight (grams), vine length (m) and yield ha^{-1} (tons). The data of all the above mentioned parameters were individually subjected to the analysis of variance techniques (Steel *et al.*, 1997). Subsequently, the significant means were separated by the Least Significant Difference Test by using the MSTATC computer program.

RESULTS AND DISCUSSION

Days taken to flowering. Fertilizer levels had significant effect on days taken to flowering. Maximum (47.99) days taken to flowering were recorded in control, followed by 60-30-30 NPK kg ha^{-1} with 44.77 days. Intermediate results for days taken to flowering were recorded in 120-60-60 kg ha^{-1} and 80-40-40 kg ha^{-1} with 42.66 and 41.44 days, respectively (Table I). The minimum (39.33) days to flowering was recorded in 100-50-50 kg ha^{-1}. The deficiency of major nutrients stunted the plant growth, resulting in maximum days taken to flowering. Gradual increase in NPK levels reduced the days taken to flowering up to a certain limit and vice versa. Similar results were quoted by Naeem *et al.* (2002) for chilli.

Days to fruit setting. Statistically significant results were observed for days to fruiting as affected by different levels of NPK, as shown in Table I. Increment in NPK level was inversely proportional to days taken to fruiting, as increased NPK level had decreased the days taken to fruit setting. Maximum (18.67) days taken to fruit setting were recorded in control, followed by 60-30-30 kg ha^{-1} and 80-40-40 kg ha^{-1} with 16.99 and 14.88 days to fruit setting, respectively. Once again 100-50-50 kg ha^{-1} took the minimum (11.55) days taken to fruit setting. Our results are in agreement with the previous findings of Naeem *et al.* (2002), who reported that days to fruit setting were statistically significant to different NPK levels in chilli.

Days to maturity. Highly significant data regarding days to fruit maturity (Table I) showed that maximum (13.49) days to fruit maturity were recorded in control, followed by 60-30-30 kg ha^{-1} and 80-40-40 kg ha^{-1} with 12.13 and 10.76 days to fruit maturity, respectively where as the minimum (7.88) days taken to fruit maturity was recorded in 100-50-50 kg ha^{-1}. The deficiency of major nutrients stunted the plant growth, resulting in prolonged time taken to fruit setting. The least days taken to fruit maturity are beneficial for obtaining earlier yield of cucumber (Waseem *et al.*, 2008).

Number of frits per plant. Maximum (35.5) fruits per plant were recorded in 100-50-50 kg ha^{-1} followed by 60-30-30 kg ha^{-1} and 80-40-40 kg ha^{-1} with 29.6 and 28.2 fruits per plant, respectively and both the treatments showed a non-significant behavior against one another. Minimum (24.5) fruits per plant were recorded in control. Proper nutrients promote vigorous growth of cucumber plant, which ultimately increases the number of fruits per plant, which confirm the observation of Waseem *et al.* (2008) for cucumber when 80 kg N ha^{-1} was applied.

Fruit length. Maximum fruit length (18.36 cm) was noted in 100-50-50 kg ha^{-1}, followed by 120-60-60 kg ha^{-1} and 80-40-40 kg ha^{-1} with 16.36 and 14.90 cm long fruits, respectively while the minimum (13.32 cm) fruit length was observed in control, in which no nitrogen was used. Increasing the NPK fertilizer application to a certain level 100-50-50 kg ha^{-1}, the fruit length increased and beyond this level it started decreasing, which revealed that the excess of fertilizer application ultimately reduced the fruit length as compared to 100-50-50 kg ha^{-1}. Similar results were quoted by Jilani *et al.* (2008) who also reported that nitrogen applied @ 100 kg ha^{-1} produced the longest brinjal fruits.

Fruit weight. Significant increase in fruit weight was observed in 100-50-50 kg ha^{-1} and 80-40-40 kg ha^{-1} with 150.69 and 136.03 grams, respectively followed by 80-40-40 kg ha^{-1} and 60-30-30 kg ha^{-1} with 127.16 and 120.23 grams fruit weight. The least fruit weight (109.6 g) was observed in control. The results revealed that by increasing NPK level the fruit weight also started increasing gradually. Our results are in agreement with the previous findings of Ahmed *et al.* (2007) who also reported that fruit weight of cucumber increased linearly with an increase in Nitrogen fertilizer rate. Similarly, Choudhari and More (2002) also observed that 150: 90: 90 kg NPK ha^{-1} produced maximum fruit weight (g) in cucumber plant.

Table I. Effect of different level of NPK on days taken to flowering, setting, fruit setting and number of fruits per plant

Treatment NPK kg ha^{-1}	Days taken to flowering	Days to fruit setting	Days to fruit maturity	Number of fruits plant^{-1}
control	47.99a	18.67a	13.49a	24.5d
(60-30-30)	44.77b	16.99b	12.13b	28.2bc
(80-40-40)	41.44d	14.88c	10.76c	29.6b
(100-50-50)	39.33e	11.55e	7.88e	35.5a
(120-60-60)	42.66c	13.55d	9.47d	26.3cd
LSD (P≤ 0.05)	0.8	0.46	1.19	2.11

Means followed by different letter shows significant result at 5% level of significance

Table II. Effect of different level of NPK on fruit length (cm), fruit weight (g), vine length (m) and yield per hectare (tons)

Treatment NPK kg ha^{-1}	Fruit length (cm)	Fruit Weight (g)	Vine length (m)	Yield (tons ha^{-1})
Control	13.32d	109.6c	1.95c	45.72e
(60-30-30)	14.40c	120.23b	1.98c	47.63d
(80-40-40)	14.90c	127.16b	213b	52.51c
(100-50-50)	18.36a	136.03a	2.53b	60.02a
(120-60-60)	16.36b	150.69a	3.85a	57.15b
LSD (P≤ 0.05)	0.99	15.54	0.12	0.86

Means followed by different letter shows significant result at 5% level of significance

Vine length. Different NPK levels significantly increased the vine length, which was maximum (3.85 m) in 120-60-60 kg ha^{-1} followed by 100-50-50 kg ha^{-1} and 80-40-40 kg ha^{-1} with 2.53 and 2.13 m long vines, respectively. Minimum vine length (1.95 m) was recorded in control. The results showed that higher the NPK application, greater would be the vegetative growth, which ultimately resulted in maximum vine length in 120-60-60 kg ha^{-1}. Our results also get support from the work done by Ahmed *et al.* (2007) and Abdel-Mawgoud *et al.* (2005) who reported an increase in cucumber vine length with an increase in nitrogen application.

Fruit yield. Different levels of NPK fertilizers have a significant effect on the yield ha^{-1} (tons). Fertilizer treatment 100-50-50 kg ha^{-1} increased the yield up to 60.02 tons, followed by 120-60-60 kg ha^{-1} and 80-40-40 kg ha^{-1} with 57.15 and 52.51 tons per hectare, respectively; whereas control has produced the least (45.72 tons) yield per hectare. NPK doses have a significant effect on yield ha^{-1}, as fertilizer treatment (100-50-50 kg ha^{-1}) produced higher yield which was due to more fruit length and maximum weight of fruit. Naeem *et al.* (2002) reported that different dozes of NPK behaved significantly different for total yield. Likewise, Jilani *et al.* (2008) reported that N application @ 100 kg ha^{-1} significantly increased brinjal yield.

CONCLUSION

NPK had positive effect on growth and yield of cucumber as it enhanced cucumber production. Amongst different levels of NPK, application of NPK @100: 50: 50 kg ha^{-1} is the optimum dose for getting maximum production of cucumber per hectare.

REFERENCES

Abdel-Mawgoud, A.M.R., M. EL-Desuki, S.R. Salman and S.D.A. Hussein, 2005. Performance of Some Snap Bean Varieties as Affected by Different Levels of Mineral Fertilizers. *J. Agron.*, 4: 242–247

Ahmed, N., M.H. Baloch, A. Haleem, M. Ejaz and N. Ahmed, 2007. Effect of different levels of nitrogen on the growth and production of cucumber. *Life Sci. Int. J.*, 1: 99–102

Anonymous, 2006. *Statistics of Pakistan 2005-2006*. Government of Pakistan, Ministry of Food, Agriculture and Live stock Division (Economic Wing), Islamabad

Choudhari, S.M. and T.A. More, 2002. Fertigation, fertilizer and spacing requirement of Tropical gynoecious cucmber hybrids. ISHS. Tsukuba, Japan. *Acta Hort.*, 61: 588

Din, M., M. Qasim and M. Alam, 2007. Effect of different levels of N, P and K on the growth and yield of cabbage. *J. Agric. Res.*, 45: 171–176

El-Aidy, F., 1992. Protected cultivation of vegetables in Saudi Arabia. *Plasticulture*, 94: 7–11

El-Amir, M.R., M.M. Helal, A.H. Al-Shemi and M.E. Mahmood, 2001. Economic feasibility of green house for some vegetable crops in Middle Egypt. *Assiut J. Agric. Sci.*, 32: 377–388

Jilani, M.S., M.F. Afzaal and K. Waseem, 2008. Effect of different nitrogen levels on growth and yield of brinjal. *J. Agric. Res.*, 46: 245–251

Naeem, N., M. Irfan, J. Khan, G. Nabi, N. Muhammad and N. Badshah, 2002. Influence of various levels of nitrogen and phosphorus on growth and yield of chilli (*Capsicum annum* L.). *Asian J. Plant Sci.*, 1: 599–601

Phu, N.T., 1996. *Nitrogen and Potassium Effect on Cucumber Yield*. ARC Training Report 1996

Rehman H.U., M.S. Jilani, M. Munir and A. Ghafoor, 1995. Effect of different levels of NPK on the performance of three varieties of cucumber. *Gomal University J. Res.*, 15: 125–133

Rubeiz, I.G., 1990. Response of greenhouse cucumber to mineral fertilizers on a high phosphorus and potassium soil. *J. Plant Nutr.*, 13: 269–273

Steel, R.G.D., J.H. Torrie and D.A. Dickie, 1997. *Principles and Procedures of Statistics: A Biometric Approach*, 3rd edition. McGraw-Hill Publishing Company, Toronto

Waseem, K., Q.M. Kamran and M.S. Jilani, 2008. Effect of different levels of nitrogen on the growth and yield of Cucumber (*Cucumis sativus* L.). *J. Agric. Res.*, 46: 259–266

Watcharasak, S. and T. Thammasak, 2005. Effect of nitrogen and potassium concentration in fertigation on growth and yield of cucumber. *Kamphaengsaen Acad. J.*, 3: 18–29

(Received 03 April 2009; Accepted 22 April 2009)