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RESEARCH ARTICLE

EFFECT OF DIFFERENT FERTIGATION LEVELS AND SCHEDULES ON GROWTH AND YIELD OF CUCUMBER UNDER POLYHOUSE CONDITION

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ABSTRACT

The fertigation level of 125 per cent of RDF as well as fertigation of recommended dose of N and K at every 2 days interval in equal splits up to 110 days + P as a basal dose to cucumber exhibited significantly maximum vine length & number of branches vine^{-1} compared to rest of the fertigation levels and schedules under polyhouse condition. Application of 125 per cent of RDF along with fertigation of recommended dose of N and K at every 2 days interval in equal splits up to 110 days + P as a basal dose to cucumber recorded significantly higher fruit length, number of fruits vine^{-1}& average fruit weight than rest of the treatment combinations during first year, second year and on pooled mean. Application of 125 per cent of RDF coupled with fertigation of recommended dose of N and K at every 2 days interval in equal splits up to 110 days + P as a basal dose to cucumber recorded significantly maximum cucumber fruit yield per unit area of polyhouse than rest of the treatment combinations during both the years and on pooled mean. Application of 125 per cent of RDF coupled with fertigation of recommended dose of N and K at every 2 days interval in equal splits up to 110 days + P as a basal dose to cucumber obtained significantly maximum gross monetary returns and B: C ratio under polyhouse condition.

INTRODUCTION

The cucumber (*Cucumis sativus* L.) is essentially a warm season crop mainly grown in tropical and subtropical regions where it is cultivated in the field. In temperate countries it is mainly grown under glass. This crop belonging to family cucurbitaceace is generally known as "cucurbits". It consists of a wide range of vegetables either used for salad purpose (cucumber) or for cooking (all gourds), pickling (West Indian Sherkin) or as desert fruit (musk melon, water melon) or candiel or preserved (ash gourd). As a group, cucurbits occupy the largest area in India and in other tropical countries. Cucurbitaceace family considered wide range of vegetables *viz*; melons, gourds, pumpkin, squashes and cucumber. Among them cucumber (*Cucumis sativus* L.) is commonly known as khira, dosakagu, sukasa, kakri, vellarikki and kakrikai. Cucumber is one of the oldest cultivated vegetable crops having its origin probably in India. It has been known in history for over 3000 years. From India, it seems to have spread to Asia and Africa and then to Europe. It was grown by ancient Greeks and Romans in about 300 B.C. At present most of the farmers using different water soluble fertilizers and applied through drip irrigation to various crops grown under protected condition or open field condition. So far the fertigation schedule has been standardizing based on various levels of recommended dose of fertilizers. It proved that the fertigation saves about 25 to 30 per cent of fertilizers coupled with higher productivity and quality (Raman *et al*., 2000). As the fertilizer is the costly input it is very essential to increase the fertilizer use efficiency by standardizing the fertigation schedule for various crops. Cucumber is one of the most important crop grown in protected condition for achieving higher productivity. However, there is no specific recommendation about scheduling of fertigation. Very meager research work has been carried out on apportioning or scheduling of fertilizers, hence there is scope to increase the productivity of cucumber by adopting suitable fertigation level and schedule. Hence the present research work has carried out to study the effect of fertigation levels and schedules on the growth, yield and quality of cucumber grown under polyhouse condition.

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MATERIALS AND METHODS

A field investigation on "Effect of different fertigation levels and schedules on growth and yield of cucumber (*Cucumis sativus* L.) under polyhouse condition" was carried out at Instructional Farm of Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.) during the year 2011-12 and 2012-13 with a view to study the growth and yield potential of cucumber under polyhouse condition. The experiment was laid out in factorial completely randomized

Table 1. Effect of different fertigation levels and schedules on growth and yield characters of cucumber (Pooled mean)

Treatment	Vine length (cm)	No. of branches	No. of Leaves	Fruit length (cm)	Fruit girth (cm)	No. of fruits vine^{-1}	Average fruit weight (g)	Fruit yield (t ha^{-1})	Gross monetary returns	B:C ratio
A. Fertigation levels (N, P_2O_5, K_2O kg ha^{-1})										
F_1-75% RDF (75:37.5:37.5)	523.86	12.97	306.92	13.64	11.71	22.54	189.37	102.00	173963	2.73
F_2-100% RDF (100:50:50)	565.64	13.99	335.04	14.66	11.75	23.72	195.75	107.49	183366	2.87
F_3-125% RDF (125:62.5:62.5)	568.41	14.66	344.96	14.98	11.92	25.56	201.76	117.39	196523	3.06
SEm±	10.23	0.29	8.34	0.13	0.09	0.41	2.26	2.22	3453	-
C.D. at 5%	30.38	0.87	24.78	0.37	NS	1.21	6.57	6.64	10355	-
B. Fertigation schedules (up to 110 days)										
S_1- Fertigation of R.D. of N and K at every 2 days interval in equal splits	583.84	15.13	356.58	15.44	12.11	25.45	204.71	117.02	198323	3.10
S_2- Fertigation of R. D. of N and K at every 4 days interval in equal splits	560.25	14.30	341.85	15.08	11.91	24.50	198.39	110.64	189954	2.97
S_3- Fertigation of R.D. of N and K at every 6 days interval in equal splits	513.83	12.20	288.49	12.75	11.85	21.87	183.77	99.22	165576	2.59
SEm±	10.23	0.29	8.34	0.13	0.09	0.41	2.26	2.22	3453	-
C.D. at 5%	30.38	0.87	24.78	0.37	NS	1.21	6.57	6.64	10355	-
C. Interaction(AXB)	NS	NS	NS	Sig.	NS	Sig.	Sig.	Sig.	Sig.	-
CV %	5.56	6.33	7.61	2.67	3.07	5.18	3.46	6.27	5.64	-

design with three replications. The treatment consisted of three fertigation levels *viz*., 75, 100 and 125 per cent of RDF and three fertigation schedules viz., fertigation of recommended dose of N and K2O at every two (2) days interval up to 110 days in equal splits (52 equal splits); fertigation of recommended dose of N and K2O at every four (4) days interval up to 110 days in equal splits (26 equal splits) and fertigation of recommended dose of N and K2O at every six (6) days interval up to 110 days in equal splits (18 equal splits).

RESULTS AND DISCUSSION

Growth characters

The fertigation level of 125 per cent of RDF exhibited significantly maximum vine length (568.41 cm), number of branches vine-1 (14.66) as compared to 75 per cent of RDF and at par with 100 per cent RDF during both the years and on pooled mean basis. Among the different schedules fertigation of recommended dose of N and K at every 2 days interval in equal splits up to 110 days + P as a basal dose to cucumber exhibited significantly maximum vine length (583.84 cm), number of branches vine-1 (15.13) as compared to fertigation of recommended dose of N and K at every 6 days interval in equal splits and at par with fertigation of recommended dose of N and K at every 4 days interval in equal splits during both the years and on pooled mean basis. This might be due to frequent and increased application of fertilizers directly in the vicinity of the root zone increases the availability and uptake of nutrients which leads to increase the cell size and cell elongation resulted in healthy and vigorous plant growth. These results were in accordance with Lee *et al*. (2005), Eifediyi and Remison (2009), Sharma *et al*. (2009) and Jilani *et al*. (2009). Also, the frequent application of recommended dose of N and K in 52 equal splits up to 110 days along with P as basal dose increases the availability of these nutrients leads to increases the uptake of N, P and K during growth period which increased protein and protoplasm synthesis for higher rate of mitosis resulted in increase the growth attributes. These results are in agreement with those reported by Al-Jaloud *et al*. (1999) and Shinde *et al*. (2010).

Yield characters

Higher fertigation of 125 per cent of RDF recorded significantly higher fruit length (14.98 cm), fruit girth (11.92 cm) number of fruits vine-1 (25.56), average fruit weight (201.76 g) and fruit yield ha-1 (117.39 t) while, fertigation of recommended dose of N and K at every 2 days interval in equal splits up to 110 days + P as a basal dose to cucumber recorded significantly higher fruit length (15.44 cm), fruit girth (12.11 cm) number of fruits vine-1 (25.45), average fruit weight (204.71 g) and fruit yield ha-1 (117.02 t) and at par with fertigation of recommended dose of N and K at every 4 days interval during both the years and on pooled mean basis. The enhanced supply of nutrients through increased fertigation level in the root vicinity of plant maintain optimum nutrient concentration in the root zone throughout the crop growth period, which increases the uptake of moisture and nutrients resulted in increasing all the growth attributes of cucumber which increases the photosynthetic rate and absorbed APAR resulted in more translocation of photosynthates towards reproductive organ (sink) which ultimately increases the yield attributes of cucumber. Janapriya *et al*. (2010) also reported that significantly higher yield and yield attributes under increased fertigation level. Similar results are also reported by Sharma *et al*. (2009), Dai *et al*. (2011) and Zhang *et al*. (2011).

Economics

Significantly maximum gross monetary returns (Rs. 1, 96, 523 unit-1 area) and B: C ratio (3.06) was obtained with application of 125 per cent of RDF while among the different fertigation schedules fertigation of recommended dose of N and K at every 2 days interval obtained significantly maximum gross monetary returns (Rs. 1, 98, 323 unit-1 area) and B: C ratio (3.10) under polyhouse condition. However, it was at par with fertigation level of 125 per cent of RDF and fertigation interval at every 4 and 6 days interval and 100 per cent RDF with fertigation interval at every 2 and 4 days interval and 75 per cent RDF combined with fertigation interval at every 2 days interval during both the years. Similar trend as that of gross

monetary returns was noticed under net monetary returns. Shinde *et al*. (2010) registered similar trend.

Conclusion

Fertigation of 125 per cent of recommended dose of nitrogen (125 kg ha-1) and potassium (62.5 kg ha-1) at every 2 or 4 days interval in equal splits up to 110 days + phosphorus (62.5 kg ha-1) as a basal dose found suitable for achieving maximum fruit yield of cucumber under polyhouse in winter season.

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