THE ASIAN JOURNAL OF HORTICULTURE
Volume **9** | Issue 1 | June, 2014 | 43-47
e ISSN- 0976-724X | Open Access-*www.researchjournal.co.in* |

Research Paper

Article history **:**
Received : 03.10.2013
Revised : 27.03.2014
Accepted : 11.04.2014

Effect of integrated nutrient management on growth attributes in custard apple cv. ARKA SAHAN

ASHEESH SHARMA, PRERAK BHATNAGAR[1] AND M.C. JAIN[1]

Members of the Research Forum

Associated Authors:
[1]Department of Fruit Science, College of Horticulture and Forestry, JHALAWAR (RAJASTHAN) INDIA
Email : prerakb_22@yahoo.co.in; jainmcchf@yahoo.in

Author for correspondence :
ASHEESH SHARMA
Department of Fruit Science, College of Horticulture and Forestry, JHALAWAR (RAJASTHAN) INDIA
Email : ashishbhar1983@gmail.com

ABSTRACT : The effect of organic and inorganic fertilizers supplemented with bio-fertilizers on growth parameters of custard apple cv. Arka Sahan during growth period (September, 2010 to March, 2011) was studied. The experiment consisted of different treatment combinations comprising recommended dose of fertilizers, vermicompost and bio-fertilizer (*Azotobacter*, PSB and VAM). Experimental findings revealed that different treatments of integrated nutrient sources significantly increased the plant parameters. Among these integrated nutrient management treatments, treatment T_{10} comprising 50 per cent recommended dose of fertilizers + 50 per cent N through vermicompost and bio fertilizers (*Azotobacter* 50 g + PSB 50 g + VAM 20 g) was found significantly superior over other treatments including control with respect to growth parameters such as per cent increase in plant height, rootstock girth, scion girth, plant spread, and number of primary branches per plant etc. in custard apple cv. Arka Sahan.

KEY WORDS : Custard apple, Bio-fertilizers, Organic and inorganic fertilizers, Growth parameters

HOW TO CITE THIS ARTICLE : Sharma, Asheesh, Bhatnagar, Prerak and Jain, M.C. (2014). Effect of integrated nutrient management on growth attributes in custard apple cv. ARKA SAHAN. *Asian J. Hort.*, **9**(1) : 43-47.

The edible fruits of genus *Annona* are collectively known as annonaceous fruits. Annonaceae family consists of 40 genera and genus *Annona* has 120 species. Annonas are very delicious, tropical fruit crop. Among them, custard apple (*Annona squamosa* L.) is considered the best. It has got pleasant flavour, mild aroma and sweet taste have a universal acceptance. Custard apple is also known as sugar apple, sweetsop, *sharifa*, *sitaphal* and *noi-na* in different parts of growing regions. Fruits are good source of sugar (20%), iron, calcium, phosphorus and ascorbic acid. Nutrition is one of the most important aspects of fruit production and accounts for 30 per cent of its total cost of cultivation. The indiscriminate use of inorganic fertilizers and synthetic pesticides leading totally to a deteriorating chemical farming scenario in the country and increased use of inorganic fertilizers resulted in elemental imbalance at soil and plant level, accumulation of harmful substances in plant soil, residual toxicity and reduced inherent resistance of crops to external influence. There is an urgent need for an alternative nutritional package to attain long term sustainability for fruit production as well as for maintaining soil productivity under integrated nutrient management (INM) system. Sanewski (1991) suggested that the use of organic fertilizers with inorganic fertilizers as a supplement to maintain a balance and to regulate cropping. Arka Sahan is a new introduction under subtropical conditions of Jhalawar and is a popular cultivar of custard apple in Southern India particularly Karnataka, therefore, present investigations were undertaken to study the response of different INM treatment combinations with a view to gain information about qualitative changes in growth attributes of custard apple cv. ARKA SAHAN.

RESEARCH METHODS

The experimental entitled integrated nutrient management in custard apple cv. Arka Sahan was conducted during the year 2010-11, at the Fruit Research Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalawar. The application of different integrated nutrient management treatments were applied during September, 2010 in two years old plants. The treatment combination were: T_1 = Control, T_2 =

Bio fertilizers (AZB 50 g + PSB 50 g + VAM 20 g/plant), T_3 = 100 % N through vermicompost (1533.33 g/plant), T_4 = 100 % NPK through chemical fertilizers (Urea 50 g + SSP 200 g + MOP 50 g/plant), T_5 = 75 % RDF + 25 % N through vermicompost (37.5g Urea + 150g SSP + 37.5g MOP + 382.25g vermicompost/plant), T_6 =50 % RDF + 50 % N through vermicompost (25g Urea + 100g SSP + 25g MOP + 766.5g vermicompost/plant), T_7 = 25 % RDF + 75 % N through vermicompost (12.5g Urea + 50g SSP + 12.5g MOP + 1149.75g vermicompost/plant), T_8 = T_4 + bio fertilizers (AZB 50g + PSB 50g + VAM 20 g/plant), T_9 = T_5 + bio fertilizers (AZB 50g + PSB 50g + VAM 20 g/plant), T_{10} = T_6 + bio fertilizers (AZB 50g + PSB 50g + VAM 20 g/plant), T_{11} = T_7 + bio fertilizers (AZB 50g + PSB 50g + VAM 20 g/plant). The experiment was laid down in randomized block design with three replications. The observations like plant spread, rootstock girth, scion girth, number of primary branches per plant, number of leaves per plant, leaf area and plant height were recorded at monthly intervals commencing from October, 2010 to March, 2011.

RESEARCH FINDINGS AND DISCUSSION

Perusal of data in Table 1 to 6 reveals that the plant spread (E-W and N-S spread), rootstock girth, scion girth, number of primary branches/plant, and plant height were significantly influenced by different integrated nutrient management treatments. The maximum increase in East-West spread (30.08 %), North-South spread (29.92 %), root stock girth (18.99 %), scion girth (13.28 %), plant height (20.68 %) and number of primary branches per plant (5.89) were recorded at 50 per cent recommended dose of fertilizers (25 g urea + 100 g SSP + 25 g MOP) along with 50 per cent N through vermicompost (766.5 g) supplemented with bio-fertilizers comprising *Azotobacter* (50 g), PSB (50 g) and VAM (20 g) treatments, followed by T_{11} treatment and minimum increase

Table 1 : Effect of integrated nutrient sources on per cent increase in East-West spread (cm) of custard apple cv. ARKA SAHAN during growth period (October 2010 to March 2011)

Treatments	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
T_1	12.86(3.04)	13.65(9.37)	14.05(12.58)	14.19(13.70)	14.72(17.94)	15.14(21.31)
T_2	14.06(3.15)	14.85(8.95)	15.80(15.92)	15.91(16.72)	16.31(19.66)	16.67(22.30)
T_3	16.81(3.06)	17.77(8.95)	18.31(12.26)	18.49(13.36)	19.15(17.41)	19.98(22.50)
T_4	17.78(3.13)	18.74(8.70)	19.43(12.70)	19.58(13.57)	20.60(19.48)	21.13(22.56)
T_5	18.08(3.43)	19.02(8.81)	19.82(13.38)	19.97(14.24)	20.79(18.93)	21.51(23.05)
T_6	21.48(3.61)	22.47(8.39)	23.18(11.81)	23.33(12.54)	24.36(17.51)	25.62(23.58)
T_7	20.36(3.08)	21.39(8.30)	22.07(11.74)	22.19(12.35)	23.43(18.63)	25.02(26.68)
T_8	21.48(3.31)	22.47(8.08)	23.22(11.68)	23.45(12.79)	24.16(16.20)	25.81(24.14)
T_9	23.32(4.34)	24.38(9.08)	25.09(12.25)	25.21(12.79)	27.17(21.56)	28.85(29.08)
T_{10}	25.32(4.49)	26.49(9.32)	27.42(13.16)	27.63(14.03)	29.22(20.59)	31.52(30.08)
T_{11}	25.26(4.07)	26.45(8.98)	27.00(11.24)	27.13(11.78)	29.07(19.77)	31.20(28.55)
S.E. (±)	1.697	0.965	0.941	0.93	1.511	1.802
C.D. (P=0.05)	3.540	2.014	1.964	1.95	3.153	3.760

Table 2 : Effect of integrated nutrient sources on per cent increase in North-South spread (cm) of custard apple cv. ARKA SAHAN during growth period (October 2010 to March 2011)

Treatments	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
T_1	15.11(1.54)	16.12(8.33)	16.92(13.70)	17.01(14.31)	17.54(17.87)	18.12(21.77)
T_2	19.15(1.97)	20.16(7.34)	21.03(11.98)	21.16(12.67)	22.17(18.05)	23.43(24.76)
T_3	20.10(2.44)	21.13(7.69)	22.18(13.04)	22.28(13.55)	23.50(19.77)	24.44(24.56)
T_4	20.15(2.12)	21.18(7.34)	22.06(11.80)	21.84(10.69)	23.07(16.92)	24.52(24.27)
T_5	22.65(2.30)	23.57(6.45)	24.56(10.93)	24.67(11.42)	25.62(15.71)	27.31(23.35)
T_6	22.70(2.66)	23.73(7.32)	24.63(11.39)	24.73(11.84)	26.12(18.13)	27.36(23.74)
T_7	23.13(2.66)	24.13(7.10)	24.81(10.11)	24.99(10.91)	26.57(17.93)	28.23(24.85)
T_8	23.78(3.30)	24.80(7.73)	25.44(10.51)	25.56(11.03)	27.20(18.15)	29.05(26.19)
T_9	25.08(3.42)	26.04(7.38)	26.78(10.43)	26.90(10.92)	28.45(17.31)	30.88(27.34)
T_{10}	26.65(4.26)	27.79(8.72)	28.81(12.71)	29.00(13.45)	31.31(22.49)	33.21(29.92)
T_{11}	26.03(3.49)	27.18(8.07	27.94(11.09)	28.11(11.76)	30.34(20.63)	32.14(27.79)
S.E. ±	1.826	1.861	1.221	1.23	2.358	2.199
C.D. (P=0.05)	3.809	3.883	2.548	2.57	4.919	4.588

Table 3 : Effect of integrated nutrient sources on per cent increase in root stock girth (mm) of custard apple cv. Arka Sahan during growth period (October 2010 to March 2011)

Treatments	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
T_1	7.24(1.11)	7.46(4.18)	7.59(6.00)	7.62(6.42)	7.84(9.49)	7.96(11.17)
T_2	7.36(1.23)	7.48(2.88)	7.60(4.53)	7.62(4.81)	7.86(8.11)	8.21(12.92)
T_3	1.56(1.20)	7.66(2.54)	7.86(5.22)	7.88(5.48)	7.98(6.82)	8.45(13.11)
T_4	7.58(1.47)	7.67(2.67)	7.79(4.88)	7.80(4.41)	7.96(6.55)	8.49(13.65)
T_5	7.70(1.31)	7.82(2.89)	7.96(4.73)	7.99(5.13)	8.25(8.55)	8.62(13.42)
T_6	7.72(1.31)	7.89(3.54)	8.11(6.43)	8.15(6.95)	8.40(10.23)	8.72(14.43)
T_7	7.81(1.42)	7.93(2.98)	8.08(4.93)	8.11(5.32)	8.33(8.18)	8.82(14.54)
T_8	7.91(1.41)	8.03(2.94)	8.22(53.84	8.25(5.76)	8.56(9.74)	8.98(15.12)
T_9	8.07(1.50)	8.23(3.52)	8.41(5.78)	8.44(6.16)	8.73(9.81)	9.26(16.47)
T_{10}	8.53(1.91)	8.65(3.34)	8.83(5.49)	8.85(5.73)	9.28(10.87)	9.96(18.99)
T_{11}	8.33(1.83)	8.43(3.05)	8.60(5.13)	8.66(5.86)	9.23(12.83)	9.64(17.84)
S.E. (±)	0.676	0.255	0.286	0.21	0.210	0.297
C.D. (P=0.05)	1.410	0.532	0.435	0.44	0.440	0.619

Table 4 : Effect of integrated nutrient sources on per cent increase in scion girth (mm) of custard apple cv. Arka Sahan during growth period (October 2010 to March 2011)

Treatments	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
T_1	6.65(1.01)	6.72(2.12)	6.84(3.95)	6.87(4.40)	6.93(5.31)	7.13(8.35)
T_2	6.68(1.21)	6.73(1.96)	6.89(4.39)	6.91(4.69)	6.99(5.90)	7.20(9.09)
T_3	6.74(1.20)	6.77(1.65)	6.95(4.35)	6.96(4.50)	7.20(8.10)	7.38(10.81)
T_4	6.88(1.32)	6.95(2.35)	7.12(4.86)	7.14(5.15)	7.26(6.92)	7.42(9.27)
T_5	6.90(1.77)	6.98(2.34)	7.16(4.98)	7.18(5.27)	7.29(6.89)	7.47(9.53)
T_6	6.93(1.31)	7.71(3.94)	7.31(6.87)	7.33(7.16)	7.42(8.47)	7.57(10.67)
T_7	7.09(1.43)	7.78(2.71)	7.29(4.29)	7.30(4.43)	7.43(6.29)	7.60(8.72)
T_8	7.27(1.25)	7.41(3.20)	7.54(5.01)	7.56(5.29)	7.68(6.96)	7.94(10.58)
T_9	7.37(1.23)	7.49(2.88)	7.69(5.63)	7.72(6.04)	7.79(7.00)	8.04(10.43)
T_{10}	7.41(1.50)	7.60(4.10)	7.84(7.39)	7.86(7.67)	7.99(9.45)	8.27(13.28)
T_{11}	7.36(1.37)	7.46(2.75)	7.59(4.54)	7.61(4.82)	7.82(7.71)	7.99(10.05)
S.E. ±	0.476	0.198	0.194	0.19	0.215	0.232
C.D. (P=0.05)	0.993	0.413	0.406	2.08	0.450	0.484

Table 5 : Effect of integrated nutrient sources on increase in number of primary branches of custard apple cv. ARKA SAHAN during growth period (October 2010 to March 2011)

Treatments	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
T_1	1.83	1.83	1.83	1.83	2.00	2.23
T_2	2.00	2.00	2.05	2.05	2.21	2.33
T_3	2.00	2.16	2.21	2.21	2.42	2.54
T_4	2.00	2.16	2.33	2.33	2.67	2.89
T_5	2.00	2.16	2.28	2.28	2.90	3.10
T_6	2.16	2.50	2.66	2.66	3.21	3.48
T_7	2.33	2.50	2.66	2.66	3.55	3.89
T_8	2.33	2.50	2.58	2.58	3.69	4.10
T_9	2.33	2.66	2.78	2.78	3.88	4.20
T_{10}	2.66	3.16	3.35	3.35	5.20	5.89
T_{11}	2.50	2.83	2.96	2.96	4.12	4.92
S.E. ±	0.326	0.209	0.217	0.217	0.108	0.09
C.D. (P=0.05)	0.680	0.437	0.452	0.452	0.226	0.20

Table 6 : Effect of integrated nutrient sources on per cent increase in plant height (cm) of custard apple cv. ARKA SAHAN during growth period (October 2010 to March 2011)

Treatments	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
T_1	29.28(1.38)	30.17(4.46)	30.90(6.99)	31.01(7.37)	31.85(10.28)	32.65(13.05)
T_2	29.79(1.98)	30.69(5.06)	31.23(6.91)	31.42(7.56)	32.58(11.53)	33.72(15.43)
T_3	29.90(2.22)	30.92(5.70)	32.28(10.35)	33.24(13.64)	33.85(15.72)	34.25(17.09)
T_4	30.35(1.94)	31.26(5.00)	32.52(9.23)	32.65(9.67)	33.68(13.13)	34.96(17.43)
T_5	30.71(2.29)	31.58(5.19)	32.88(9.52)	33.04(10.05)	34.12(13.65)	35.39(17.88)
T_6	33.01(1.50)	33.95(4.39)	34.71(6.73)	34.92(7.38)	35.87(10.30)	37.12(14.14)
T_7	33.83(1.95)	34.96(5.36)	35.60(7.29)	35.83(7.98)	36.90(11.21)	38.16(15.00)
T_8	35.93(2.07	36.91(4.85)	37.52(6.59)	37.77(7.30)	38.93(10.59)	40.42(14.82)
T_9	37.08(2.43)	38.19(5.49)	38.78(7.12)	39.05(7.87)	40.89(12.95)	43.12(19.11)
T_{10}	39.86(2.78)	41.18(6.18)	42.10(8.56)	42.37(9.25)	44.45(14.62)	46.80(20.68)
T_{11}	37.45(2.65)	38.57(5.72)	39.06(7.07)	39.29(7.70)	41.80(14.58)	43.65(19.65)
S.E. (±)	1.811	2.03	2.04	2.01	1.872	1.699
C.D. (P=0.05)	3.778	4.24	4.25	4.20	3.906	3.545

in East-West spread (21.31 %), North-South spread (21.77 %), rootstock girth (11.17 %), scion girth (8.35 %), plant height (13.05 %), number of primary branches/plant (2.23), were recorded under control. Similar trend in increase of plant growth characteristics under INM using vermicompost were recorded by Meena *et al*. (2007) in dill, Choudhary and Chandra (2006) in okra, Choudhary *et al*. (1975) and Muhammad *et al*. (2000) in guava, Gangadharan and Gopinath (2000) in gladiolus and Rodriguez Navarro *et al*. (2000) in gerbera, Shukla *et al*. (2009) in guava. Dutta *et al*. (2009) recorded that the effect of bio-fertilizer along with inorganic fertilizer on growth and productivity of guava cv. L-49, experimental findings revealed that different treatments of bio-fertilizers and inorganic fertilizer significantly increased the plant height and spread. *Azospirillum* + VAM inoculation along with 100 % P_2O_5 showed maximum plant height and spread while control recorded minimum. Singh *et al*. (2009) observed that the nitrogen fixing bacteria and bio regulators were observed to exhibit significant effect on the growth characters in strawberry plants. The maximum growth in term of plant height, number of leaves, leaf area, crown per plant and total biomass were observed in the treatment consisting of *Azotobacter* + *Azospirillum* + 60 kg N ha^{-1} + 100 ppm GA_3.

Conclusion:

On the basis of results obtained from the field experiment entitled "Integrated Nutrient Management in custard apple cv. Arka Sahan", it may be concluded that application of 50 % recommended dose of fertilizer along with 50 per cent N through vermicompost supplemented with bio-fertilizers comprising of *Azotobacter* (50 g), PSB (50 g) and VAM (20 g) was found suitable for plant growth parameters likewise plant height, plant spread, rootstock girth, scion girth etc. of custard apple cv. Arka Sahan under Jhalawar condition and it may be introduced under Jhalawar conditions provided shelterbelts of trees for suitable microclimate to young plants.

REFERENCES

Choudhary, D.N., Shyamal, N.R. and Maurya, K.R. (1975). Influence of inorganic and organic manures alone and in combination on growth, yield and chemical qualities of guava (*Psidium guajava* L.). *Indian Food Packer*, **29** : 24-26.

Choudhary, M.K. and Chandra, Atul (2006). Effect of integrated nutrient management on growth quality effect and nutrients status in okra and its residual effect on succeeding crop radish. *Indian J. Arid Hort.*, **1** : 52-53.

Dutta, P., Maji, S.B. and Das, B.C. (2009). Studies on the response of bio-fertilizer on growth and productivity of guava. *Indian J. Hort*., **66**(1) : 39-42.

Gangadharan, G.D. and Gopinath, G. (2000). Effect of organic and inorganic fertilizers on growth and quality of gladiolus (*Gladiolus grandiflorus* L.) cv. WHITE PROSPERITY. *Karnataka J. Agric. Sci.*, **13** (2) : 401-405.

Meena, S.S., Mehta, R.S., Singh, R.K., Malhotra, S.K. and Vashistha, B.B. (2007). Effect of sheep manure, vermicompost and biofertilizer on productivity of dill. *Indian J. Arid Hort*., **2** : 29-30.

Muhammad, F., Shakir, M.A. and Salik, M.R. (2000). Effect of individual and combined application of organic and inorganic manures on the productivity of guava (*Psidium guajava* L.). *Pakistan J. Biol. Sci*., **3** (9) : 1370-1371.

Rodriguez Navarro, J.A., Zavaleta Mejia, E., Sanchez Garcia, P., and Gonzalez Rosas, H. (2000). The effect of vermicopost on plant nutrition, yield incidence of root and crown rot of gerbera. *Latinoamericana de Fitopatologia* (ALF). *Fitopatologia*, **35**: 66 - 79.

Sanewski, G.M. (1991). Custard apple cultivation and crop protection, Information series, Q190031. Qld. Dept. Prim. Industry, Brisbane, AUSTRALIA.

Shukla, A.K., Sarolia, D.K., Kumari, Bhavana, Kaushik, R.A., Mahawer, L.N. and Bairwa H.L. (2009). Evaluation of substrate dynamic for integrated nutrient management under high density planting of guava cv. Sardar. *Indian J. Hort.*, **66** (4): 461-464.

Singh, B., Singh, B., Masih, M.R. and Choudhari, R.L. (2009). Evaluation of P and S enriched organic manures and their effect on seed yield and quality of coriander (*Coriandrum sativum*). *Internat. J. Agric. Sci.*, **5**(1): 18-20.