HortFlora Research Spectrum
Vol. 5, Issue 2; 89-98 (June 2016)
www.hortflorajournal.com
ISSN: 2250-2823

GROWTH AND PHYSIOLOGICAL CORRELATIONS IN CUSTARD APPLE CV. RAIDURG UNDER CONSORTIUM OF VERMICOMPOST AND PSB

Asha Sharma[1], P. Bhatnagar*, J. Singh[1], M. K. Sharma[2] and M.C. Jain[2]

[1]*Department of Fruit Science, College of Horticulture and Forestry, Jhalarapatan, Jhalawar-326 023 (Rajasthan), India*

[2]*Department of Natural Resource Management, College of Horticulture and Forestry, (AU Kota Campus),*
**Corresponding Author's E-mail: prerakb_22@yahoo.co.in*

ABSTRACT : The field experiment on Influence of Vermicompost and PSB on growth and carboxylation efficiency of custard apple (*Annona squamosa* L.) cv. Raidurg was carried out at Fruit Research Farm, Department of Fruit Science at College of Horticulture and Forestry, Jhalawar (Rajasthan) during study period from October 2014 to April 2015. The experiment consisted of different doses of Vermicompost (2kg/plant, 4kg/plant and 6kg/plant) along with PSB (25g/plant, 50g/plant and 75g/plant) and its combination. The results revealed positive correlation of photosynthesis with increase in no. of shoots/branch; increase in canopy volume and percentage increase of scion girth under interactive effect of Vermicompost @ 6kg + PSB 75g/plant .The result showed that maximum per cent increase in East-West (18.22%), North-South spread (17.83%), plant height (18.34%), canopy volume (34.50%), leaf length (29.36%) as well as leaf width (25.77%), increased number of shoots (15.78), scion girth (8.28%), rootstock girth (8.51%) and relative water content (73.71%) were recorded under T_{15} treatment *i.e.* Vermicompost@ 6kg + PSB 75g/plant. The carboxylation efficiency parameters were also observed maximum in respect of photosynthetic rate(5.60µmol $CO_2m^{-2}s^{-1}$), photosynthetic active radiation (1608.33mmol $m^{-2}s^{-1}$), stomatal conductance (14.67 m mol $m^{-2}s^{-1}$), leaf temperature (38.13°C), relative humidity (5.84%), internal CO_2 concentration (284.67ppm), transpiration rate (1.33 mmol $m^{-2}s^{-1}$), and minimum vapour pressure deficit (47.80 mb) were noted under T_{15} treatment (Vermicompost 6kg + PSB 75g/plant).

Keywords : *Custard apple, vermicompost, PSB, growth. photosynthetic rate.*

Custard apples are very delicious, sub tropical, deciduous fruit crop belonging to Annonaceae family. Amongst different Annona species, custard apple (*Annona squamosa* L.) is considered the best. It is a small, semi or late deciduous, much branched shrub or small tree with a broad, open crown or spreading branches. The simple alternate leaves occur singly. It is sensitive to cold or frost being defoliated below 10°C. It is also known as sugar apple, sweetsop, sharifa, Sitaphal and *noi-na* in different parts of growing regions of the world. Fruits are used mainly as dessert fruits, also used in ice-creams and other milk products. Fruits are good source of sugar (20%), iron (6%), calcium (17.6-27mg) and ascorbic acid (15-44.4mg). *Annona squamosa* is a deciduous tropical tree that progressively sheds its leaves with the onset of spring under North Indian conditions.

In India, present area under custard apple is 21.55 thousand hectares with a production of 165.64 thousand tonnes and average productivity of 6.9 ton/ha. (Anon., 2). Custard apple has been originated from West Indies and South America and at present, cultivation of custard apple is undertaken at large scale in Australia, Brazil, India, Israel and USA. It has not gained yet commercial significance in India but is being grown in Gujarat, Maharashtra, Andhra Pradesh, Chhattisgarh, Karnataka, Bihar, Assam and Orissa. It is found growing naturally in sub-mountainous parts of Aravalli hills of Udaipur, Chittorgarh, Rajsamand and Malwa plateau of Kota, Baran and Jhalawar.

Plant nutrition is one of the most important fundamental aspects of fruit growth. Vermicompost are products derived from the accelerated biological degradation of organic wastes by earthworms and microorganisms. It improves the physical, chemical and biological properties of the soil (enrichment of micro-organisms, addition of growth hormones such as auxin and gibberellic acid addition of enzymes such as phosphates, cellulase etc.). The earthworm species most often used are Brandling Worm (*Eisenia fetida*). The mineral nutrient aspect applied to underutilized fruit crops greatly affects the productivity of custard apple (Costa *et al.,* 6).

Article's History:
Received : 09-05-2016 ***Accepted : 14-06-2016***

Phosphorous is a second key element after nitrogen as a mineral nutrient in terms of quantitative plant requirement (Sharma *et al.*, 22). Poor availability or deficiency of phosphorous markedly reduces plant size and growth. However, a large portion of soluble inorganic phosphate applied to the soil as chemical fertilizer is immobilized rapidly and becomes unavailable to plants (Goldstein, 10). Phosphorus Solubilizing Bacteria plays an important role in converting insoluble phosphatic compound (such as rock phosphate, bone meal and basic slag) into available form. Inorganic phosphorus is solubilized by the action of organic and inorganic acids secreted by PSB in which hydroxyl and carboxyl groups of acids chelate cations (Al, Fe, Ca) and favours decrease of pH in basic soils. In particular, soil microorganisms are effective in releasing phosphorus from inorganic and organic pools of total soil phosphorus through solubilization and mineralization (Hilda and Fraga, 13).

One of the most physiological feature sensitive to carboxylation efficiency (Socias *et al.,* 25) is the stomatal conductance which governs the photosynthetic rate in plant, generally stomata close in response to water relation in consonance with water potential or relative humidity of leaves (Medrano, 15) and can also close when the difference in the level of moisture in the leaf and the air decreases (Oren *et al.,* 18) *i.e.* when the relative humidity of the leaves are usually low. Keeping in view point all the above facts, the research work entitled Consortium of Vermicompost and PSB on growth and carboxylation efficiency of Custard apple cv. Raidurg was undertaken under Vertisols of Jhalawar district to harness the effect of organic and bioinnoculant in this potential underutilized fruit crop.

MATERIALS AND METHODS

Precipitation of Study area : The study area of Jhalawar district receives on an average 1000mm minimum rainfall. The soil type comes under clay loams which is having high retention capacity. Major amount of rainfall is recieved during the months of July-September. September onwards till May lean rainy days occassional (50 mm) are observed.

The present investigation was carried out on four years old custard apple cv. Raidurg plants of uniform size and canopy spaced at 5×5 m growing at the Fruit Instructional farm under Department of Fruit Science, College of Horticulture and Forestry, Jhalawar during October 2014 to April 2015. The experiment was laid out in Randomized Block Design.The treatments were applied on Is week of October 2014 after recording initial (base) value of growth parameters. The best quality Vermicompost was prepared using fresh cow dung. The dung immediately after collection was spread on the ground surface to a thickness of about 10 cm. It was sprinkled with water in order to make it cool and ultimately better to make worms (*Eisenia fetida*) survive better. Cooled down dung was then heaped to a height of 30 cm. Entire heap was covered with gunny cloth. The structure for vermicomposting was prepared under the shade of the tree. After 60 days, composted material was collected; worms were segregated and used purposely under the experiment. Occasional water sprinkling was done to supply moisture better for the growth of worms. Vermicompost having elemental composition of N, P, K (1.5%, 2.00%, 0.75%) and PSB culture consisting of Bacillus megaterium were selected and procured from Krishi Vigyan Kendra, Jhalawar and Department of Soil Science, Rajasthan College of Agriculture, Udaipur, respectively for the purpose of experimentation. Desired quantity of Vermicompost and PSB in wet form under sixteen treatment combinations was applied after thorough mixing with the help of spade up to the depth of 10 cm in the soil as per canopy area ($1\ m^3$) of individual plant. To ensure survival of plants irrigation was provided after soil application of treatments. Individual plants were irrigated in canopy following ring basin method. Irrigation using on an amount (100 litre H_2O/ plant) was provided during October- November, 2015 months; two irrigations were given during this period and irrigation was given by Parshall Flume in canopy area of treated plants as custard apple plants has surface feeding root system. During December-January no irrigation was given to the plants. Further with the rise of temperature (27-30°C), two irrigations were given during February and March 2016.

The treatment combinations were :

T_0-Control, T_1-Vermicompost 2kg/plant, T_2-Vermicompost 4kg/plant, T_3- Vermicompost 6kg/plant,

T_4- PSB 25g/plant,T_5- PSB 50g/plant, T_6- PSB 75g/plant,T_7- Vermicompost 2kg +PSB 25g/plant,

T_8- Vermicompost 2kg/plant+PSB 50g/plant, T_9-Vermicompost 2kg +PSB 75g/plant, T_{10}-Vermicompost 4kg +PSB 25g/plant, T_{11}- Vermicompost 4kg +PSB 50g/plant, T_{12}- Vermicompost 4kg +PSB 75g/plant, T_{13}-Vermicompost 6kg +PSB 25g/plant, T_{14}-Vermicompost 6kg +PSB 50g/plant, T_{15}-Vermicompost 6kg +PSB 75g/plant.

Different parameters forming part of the study are given as under:

Growth parameters

Periodical increment in growth attributes on monthly basis during study period were measured on growth attributes like plant spread E-W and N-S, plant height, canopy volume, leaf length and leaf width help of measuring scale, increase in number of shoots were recorded visually on monthly basis, scion girth and rootstock girth were measured with the help of a digital Vernier Callipers. A composite sample of leaf discs of custard apple was taken and fresh weight was determined followed by flotation on water for 4 hours. The turgid weight is then recorded, and the leaf tissue is then oven dried subsequently to a constant weight at 85oC. Relative water content percentage of custard apple leaves was calculated using following formula:

$$RWC\ (\%) = \frac{FW - DW}{TW - DW} \times 100$$

(Where : *FW* = fresh weight of leaves, *DW* = Dry weight of leaves, *TW* = Turgid weight of leaves)

The cumulative increase in plant growth was calculated month wise on the basis of initial base values.

Carboxylation efficiency parameters

Carboxylation efficiency parameters viz. photosynthetic rate (mol $CO_2 m^{-2} s^{-1}$), photosynthetic active radiation (m mol $m^{-2} s^{-1}$), stomatal conductance (mmol $m^{-2} s^{-1}$), leaf temperature (°C), relative humidity (%), internal CO_2 concentration (ppm), transpiration rate (mmol $m^{-2} s^{-1}$) and vapour pressure deficit (mb) on physiologically mature leaves of Custard apple using infra red gas chamber analyser CIRAS-2 PP system USA at 30 days interval for a total growth period of 210 days from October, 2014 to April, 2015.The data obtained during the experimentation were subjected to statistical analysis using Fisher's (8) analysis of variance technique. The significance of the treatments was tested through 'F' test at 5 per cent level of significance. The critical difference CD was calculated to assess the significance of difference among the different treatments.

RESULTS AND DISCUSSION

The consortium of Vermicompost and PSB on growth and carboxylation efficiency variables of Custard apple cv. Raidurg is presented under suitable subheadings:

1. Plant Growth parameters

The observations were recorded on different aspects viz. plant growth characteristics plant spread (East-West and North-South), plant height, canopy volume, leaf length, leaf width, number of shoots, rootstock girth, scion girth and relative water content of leaves (%) were significantly influenced by Vermicompost and PSB. The data presented in Table 1 revealed that growth parameters were found highest under T_{15} treatment during the study period i.e. from October 2014 to April 2015.

However during April 2015, the maximum percentage increase in plant spread East-West (10.03%) and North-South (9.48%) under T15 treatment (Vermicompost 6kg+PSB 75g/plant). Whereas, minimum East-West spread (4.95%) and North-South spread (4.85%) were observed under control. The maximum percentage increase in plant height (1.84%) and canopy volume (32.96%) were noted under T_{15} treatment (Vermicompost 6kg + PSB 75g/plant) and minimum per cent increase plant height (4.96%) and canopy volume (15.56%) under control.

The maximum percentage increase in leaf length (24.64%) as well as leaf width (19.66%) were observed under T_{15} treatment (Vermicompost 6kg+PSB 75g/plant) and minimum percentage increase in leaf length (13.83%) and leaf width (12.34%) were recorded in control. The growth trend in percent increment of leaf length and leaf width in response to effects of different treatments of Vermicompost and PSB from base value to final value after study period is depicted in Fig.10 and Fig.11, respectively.

The maximum increase in number of shoots (16.00) was observed under T_{15} treatment (Vermicompost 6kg+PSB 75g/plant) and minimum increase in number of shoots (11.00) might be due to prevalence of better growing conditions till first week of December followed by cessation of growth with winter during December – January and resumption of speedy growth on onset of spring during February – March. The comparative trend of increase in number of shoots/branch as a result of different treatments is exhibited in Fig.10.

Maximum percentage increase in scion girth (8.28%) was reported under T_{15} treatment after the completion of study period and depicted in Fig.9. The maximum relative water content of leaves (75.77%)

under T_{15} treatment (Vermicompost 6kg+PSB 75g/ plant) might be attributed to increase in turgidity and relative water holding capacity of leaves as evident in the results. and minimum relative water content of leaves (65.47%) was noted under control.

Present findings are duly supported by Jain *et al.* (14) in Nagpur mandarin, Muhammad *et al.* (17) in guava, Singh *et al.* (25) in strawberry, Hazarika and Ansari (12) in banana and also by Sharma and Bhatnagar (21) in custard apple cv. Arka Sahan.

2. Carboxylation efficiency parameters

The date elucidated in Table 2revealed that the carboxylation efficiency parameters of custard apple shown variations with advancement of growth period of observations from October 2014 to April 2015 after application of treatments. During April 2015, maximum photosynthetic rate (5.60 µmol $CO_2 m^{-2} s^{-1}$), photosynthetic active radiation (1608.33 µmol(photon) $m^{-2} s^{-1}$), stomatal conductance (14.67mol$(H_2O) m^{-2} s^{-1}$), leaf temperature (38.13°C) in treatment T_{13}, relative humidity (5.84%), internal CO_2 concentration (284.67ppm), transpiration rate (1.33 mmol $m^{-2} s^{-1}$), and minimum vapour pressure deficit (47.80 mb) were noted under T_{15} treatment (Vermicompost 6kg +PSB 75g/plant) and minimum photosynthetic rate (3.10 µmol $CO_2 m^{-2} s^{-1}$), photosynthetic active radiation (1192.33 mmol $m^{-2} s^{-1}$),stomatal conductance (6.33 mmol $m^{-2} s^{-1}$),leaf temperature (35.16°C), relative humidity (4.07%),transpiration rate (0.67 mmol $m^{-2} s^{-1}$) and maximum vapour pressure deficit (60.76 mb) were noted in control.

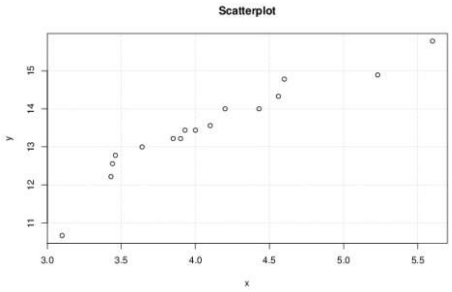
Plant growth attributes

Increase plant growth attributes viz. plant spread (East-West and North-South), plant height, canopy volume, leaf length, leaf width, number of shoots, rootstock girth, scion girth and relative water content of leaves (%) of custard apple plants under T_{15} treatment might be due to synergistic effect of Vermicompost and PSB at higher dose augmented by enhanced availability of macro and micro nutrients, growth hormones (auxin and gibberellins), vitamins, enzymes, humic acid and beneficial microbes etc. (Anitha *et al.,* 1) and mineralization may account for the higher nitrogen content which led to the increase in soil fertility status ultimately facilitating higher uptake of nutrient, particularly nitrogen being the chief constituent of cell division, chlorophyll, protein and amino acid is accelerated in rhizosphere through its increased supply at appropriate time to the plant and improving plant growth (Atiyeh *et al.*, 4)The present investigations were also supported by findings of Arancon *et al.,* (3) in strawberry. The maximum percentage increases in leaf length (29.36%) as well as leaf width (25.77%) were observed under T_{15} treatment (Vermicompost 6kg + PSB 75g/plant). It may be attributed to synergistic effect of both Vermicompost and PSB as it provides major nutrients and micro nutrients required for growth and development of plants as well as higher photosynthetic efficiency which in turn influence the biomass production and synthesize more metabolites. The present results are supported by findings of Patil and Shinde (19) in banana. Maximum percentage increase in scion girth (8.28%) and rootstock girth (8.51%) under T_{15} treatment might to due to the accumulation of polyhydroxybutyric acid which gives to vegetative cells through PSB and stimulative effect of vermicompost has been reported to contain 40-60% higher levels of humic compounds than conventional compost (Dominguez *et al.,* 7). The present findings supported by the fact that vermicompost increases the surface area, absorbability and stimulates the hormonal activity in plants. (Grapelli *et al.,*11). Present findings are duly supported by Jain *et al.* (14) in Nagpur mandarin, Muhammad *et al.* (17) in guava, Singh *et al.* (24) in strawberry, Hazarika and Ansari (12) in banana and by Sharma and Bhatnagar (21) in custard apple cv. Arka Sahan.

Carboxylation efficiency performance of custard apple

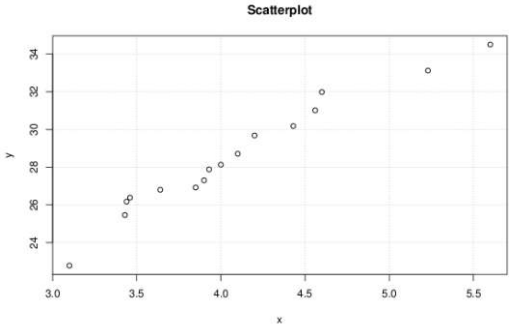
The photosynthetic rate (Pn) was found maximum in T_{15} treatment (Vermicompost 6kg+PSB75g/plant) over all other treatments because of ample intensity of photosynthetic active radiation, increased leaf length and width, better stomatal conductance with high relative humidity percentage of leaf and better water relations as a result of better uptake through Vermicompost and Phosphorous Solubilising Bacteria. The present results are in conformity to finding of increase in plant growth and canopy structure as reported by Rathore and Dhyani (20) in guava. The trend presented in Fig. A reveals positive correlation of photosynthetic rate versus increase in no. of shoots/branch (r = 0.9977*) under cumulative interactive effect of vermicompost and PSB under T_{15} treatment.

Fig. A: Correlation of Pn with Increase in no. of shoots/branch under interactive effect of vermicompost and PSB.



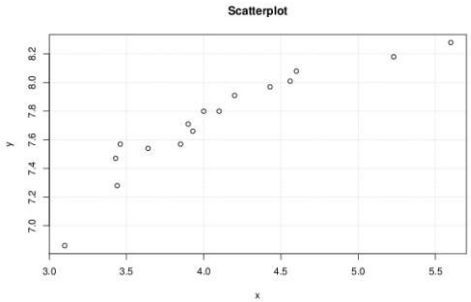
Another similar trend was observed with respect to synergistic impact of assimilation efficiency as a response of (Vermicompost 6kg+PSB75g/plant) on canopy volume of custard apple plants depicted in Fig.B.

Fig. B: Correlation of Pn with % increase in canopy volume under Interactive effect of vermicompost and PSB.



The trend depicted in Fig. C revealed an outstanding positive correlation of Pn with concomitant increase in % scion girth at higher dose of vermicompost and PSB under T_{15} treatment.

Fig. C : Correlation of Pn with increase in % scion girth under interactive effect of vermicompost and PSB.



The ascending trend of Pn in response to differential treatments of vermicompost and PSB has been depicted in Fig.1.

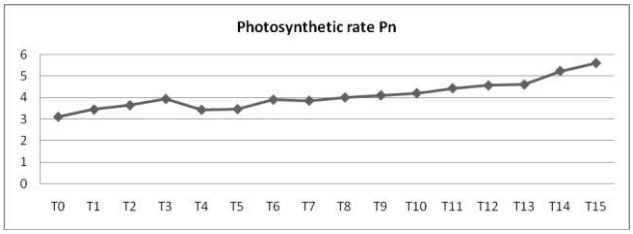


Fig.1: Photosynthetic rate trend in response to effect of Vermicompost and PSB (April, 2015)

The photosynthetic active radiation (PAR) recorded during study period reveals high intensity of light required for better carbon assimilation efficiency for reaching the optimal levels of photosynthesis. This efficiency has compound effect on net photosynthetic rate and photosynthetic distribution. The present study indicates higher photosynthetic rate of custard apple under T_{15} treatment at relatively high light intensity. The results of present findings are in accordance with those as reported by Vu and Velnenosky (27) in Valencia orange. The acclimation of photosynthetic active radiation in custard apple plants in response to varying treatments of Vermicompost and PSB has been shown in Fig.2.)

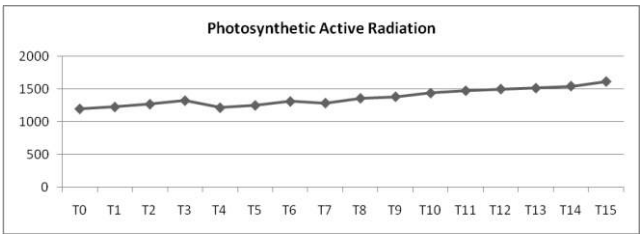


Fig. 2: Photosynthetic active radiation acclimation under varying treatments of Vermicompost and PSB (April, 2015).

Maximum stomatal conductance under T_{15} treatment might be due to better leaf surface providing more number of stomata. The variation in oscillation of stomatal conductance under differential treatments of Vermicompost and PSB has been depicted in Fig.3.The effect of environment control on stomatal conductance (gs) and carbon assimilation efficiency and ultimately plant growth, vapour pressure deficit between leaf and air is governed by stomatal conductance and inverse relationship exists between stomatal conductance and vapour pressure deficit. The results of present findings are in agreement with those

as reported by Bhatnagar and Kaul (5) in environmental studies on Kinnow mandarin.

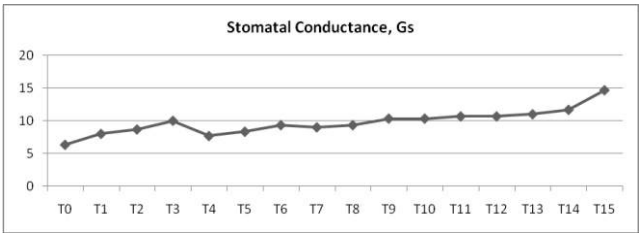


Fig. 3: Variation in oscillation of stomatal conductance under differential treatments of Vermicompost and PSB (April, 2015)

The fluctuations in leaf temperature due to month wise variation could be attributed to the prevailing light incidence and environmental condition on canopy of the custard apple plants at the time of recording observations. Fluctuations in leaf temperature in response to treatments effect of Vermicompost and PSB has been presented in Fig.4.Similar findings have been reported by Bhatnagar and Kaul (5) on photosynthetic studies on Kinnow in Western Rajasthan.

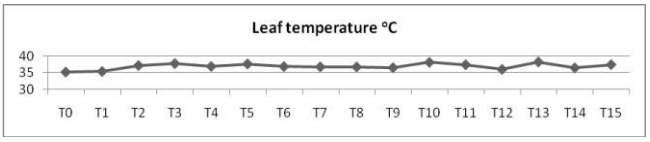


Fig.4: Fluctuations in leaf temperature in response to treatments effect of Vermicompost and PSB (April, 2015).

The present study reveals variation in relative humidity percentage of custard apple leaves under application of Vermicompost and PSB treatments. The higher relative humidity percentage under T_{15} treatment might be attributed to increased water use efficiency and increased nutrient uptake, which in turn resulted in improved photosynthetic rate. The higher relative humidity per cent indicates better electrolytic balance of ions seemingly essential for better photosynthetic production and favourable microclimate essential for good growth of custard apple plants. The micro-climatic variation observed in relative humidity % of custard apple leaves in response to differential treatments of Vermicompost and PSB has been depicted in Fig.5.

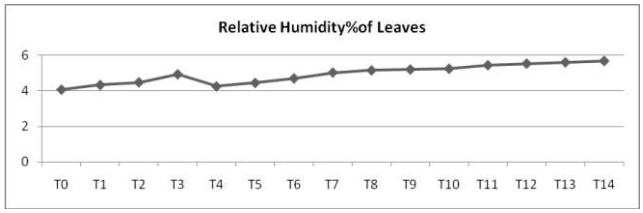


Fig 5: Observed micro-climatic variation in relative humidity % of custard apple leaves under differential treatments of Vermicompost and PSB (April, 2015)

Similar findings have been reported by Sharma *et al.* (23) in custard apple. The higher internal CO_2 concentration under T_{15} treatment applied Vermicompost6kg and PSB75g/plant which has increased uptake, mobilization and assimilation of nutrients in rhizophere highlighting the potential of absorption of atmospheric CO_2 through sequestration mechanism and increased enzyme activation of physiology processes in custard apple plants. Similar result has been observed by Sharma *et al.* (23) in custard apple. The measured fluctuation in Internal CO_2 concentration of custard apple leaves under differential treatments of Vermicompost and PSB has been exhibited in Fig.6.

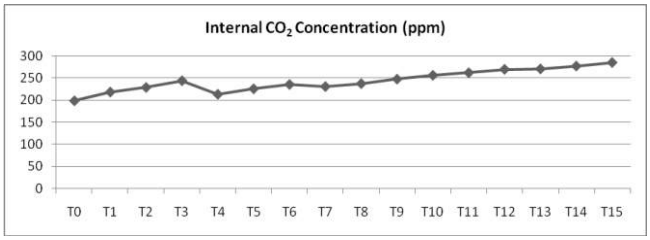


Fig.6: Fluctuations in Internal CO_2 concentration of custard apple plants in response to effect of Vermicompost and PSB (April, 2015)

The higher transpiration rate under T_{15} treatment exhibits with high relative humidity percentage of leaves which indicates better utilization and uptake of water and nutrients. Similar findings have been reported by George *et al.* (9) in custard apple. Higher transpiration rate envisages a cooling mechanism to the custard apple plants for survival of internal plant metabolism through low vapour pressure deficit as observed under treatment T_{15}. The variability in transpiration rate observed in custard apple plants in response to treatment effects of Vermicompost and PSB has been depicted in Fig.7. High vapour pressure deficit indicates low stomatal conductance which causes stomatal closure as a feedback response to mechanism of transpiration and water loss from the leaf rather than as a direct response to humidity (Meinzer and Grantz, 16). Similar findings have been reported by Veste *et al.* (26) in pummelo (*Citrus grandis*), Sharma and Bhatnagar (21) in custard apple.

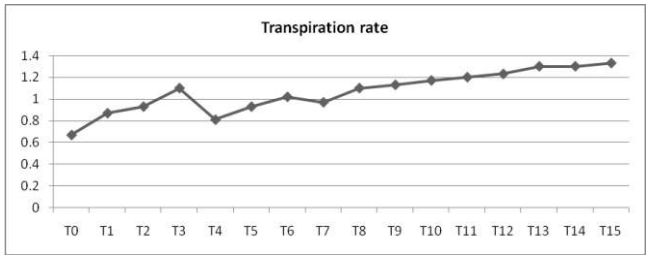


Fig.7: Transpiration rate variability under differential treatments of Vermicompost and PSB (April, 2015)

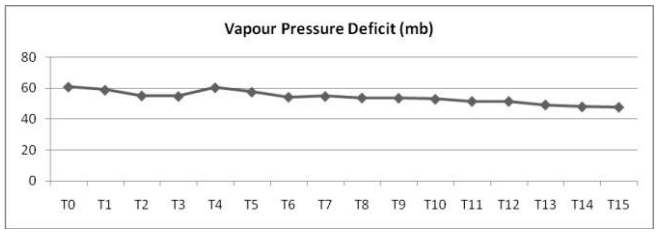


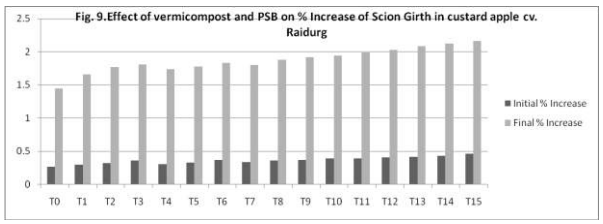
Fig.8: Differences in vapour pressure deficit in response to varying treatments effect of Vermicompost and PSB

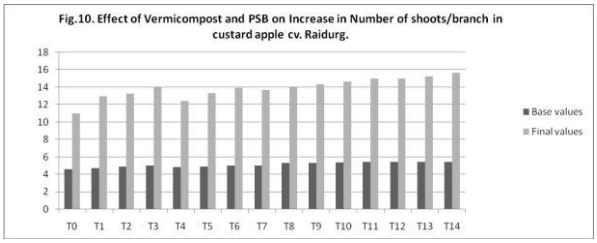
Table 1 : Effects of Vermicompost and PSB on growth parameters of custard apple cv. Raidurg after completion of study Period.

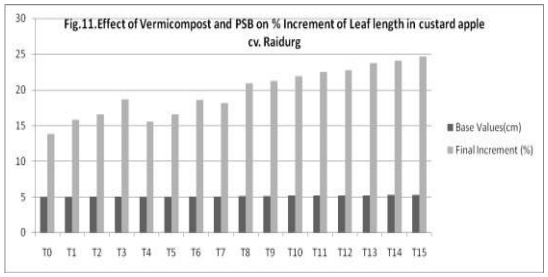
Treatments	Base Value (m)	Plant spread (%) Increment Increase		Plant spread (%) Increment Increase			Plant height (%) Increment Increase			Canopy volume (m^3)		
		E-W		N-S								
		Initial Increment	Final Increment	Base Value	Initial Increment	Final Increment	Base Value	Initial Increment	Final Increment	Base Value	Initial Increment	Final Increment
T_0	1.36	0.93	4.95	1.33	0.87	4.85	1.55	0.95	4.96	2.93	2.74	15.56
T_1	1.41	1.15	6.38	1.36	1.08	6.14	1.54	1.20	6.29	3.09	3.54	20.16
T_2	1.50	1.18	6.62	1.48	1.13	6.48	1.63	1.25	6.66	3.79	3.65	21.26
T_3	1.55	1.29	7.03	1.55	1.26	6.74	1.57	1.37	7.06	3.95	4.00	22.68
T_4	1.50	1.10	6.03	1.44	1.04	5.71	1.53	1.21	6.18	3.46	3.41	18.98
T_5	1.55	1.18	6.31	1.50	1.10	6.27	1.68	1.24	6.58	4.09	3.65	21.04
T_6	1.65	1.23	6.82	1.55	1.19	6.54	1.75	1.31	6.90	4.69	3.81	21.98
T_7	1.52	1.19	6.63	1.45	1.14	6.42	1.65	1.29	6.75	3.81	3.71	21.38
T_8	1.40	1.35	7.07	1.34	1.30	6.97	1.52	1.38	7.16	2.99	4.14	22.84
T_9	1.50	1.37	7.36	1.48	1.34	7.13	1.70	1.42	7.49	3.95	4.23	23.89
T_{10}	1.51	1.42	7.88	1.32	1.36	7.45	1.66	1.50	7.87	3.48	4.40	25.53
T_{11}	1.50	1.43	8.04	1.44	1.39	7.76	1.73	1.51	8.08	3.91	4.43	26.16
T_{12}	1.60	1.49	8.37	1.52	1.40	8.13	1.70	1.61	8.27	4.33	4.65	27.16
T_{13}	1.52	1.58	8.69	1.45	1.42	8.56	1.60	1.70	8.86	3.69	4.93	28.61
T_{14}	1.45	1.68	9.22	1.35	1.52	8.94	1.72	1.73	9.27	3.53	5.18	30.35
T_{15}	1.55	1.77	10.03	1.50	1.69	9.48	1.68	1.84	10.18	4.09	5.48	32.96
CD (P=0.05)		0.31	0.62		0.52	0.87		0.52	0.70		0.45	1.19

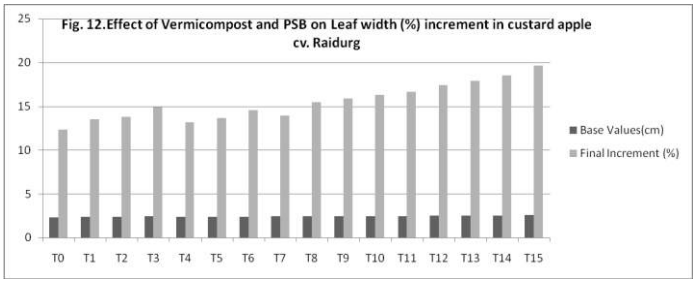
Table 2: Effects of Vermicompost and PSB on growth parameters of custard apple cv. Raidurg after completion of Study Period

Treatments	Leaf length (% Increment)		Leaf width (%Increment)		Scion Girth (%Increment)			Increase in Number of Shoots/branch		Relative Water Content (%)	
	Base Value (cm)	Final Increment	Base Value (cm)	Final Increment	Base Value (mm)	Initial Increment	Final Increment	Base Value	Final Value	Base Value	Final Value
T_0	4.90	13.83	2.30	12.34	33.71	0.27	1.45	4.58	11.00	53.72	65.47
T_1	4.92	15.79	2.37	13.48	42.22	0.30	1.66	4.72	13.00	55.59	67.66
T_2	5.00	16.57	2.40	13.82	35.84	0.32	1.77	4.92	13.25	55.70	68.81
T_3	5.04	18.61	2.43	14.92	41.77	0.36	1.81	5.00	14.00	57.11	70.51
T_4	4.92	15.51	2.35	13.13	36.49	0.31	1.74	4.83	12.42	55.42	67.00
T_5	4.95	16.55	2.37	13.67	38.92	0.33	1.78	4.91	13.33	55.68	67.98
T_6	5.00	18.53	2.40	14.53	41.36	0.37	1.83	5.00	13.92	56.55	69.44
T_7	5.00	18.15	2.43	13.96	38.21	0.34	1.80	5.00	13.67	56.06	68.96
T_8	5.11	20.88	2.44	15.45	34.11	0.36	1.88	5.33	14.00	57.29	69.74
T_9	5.11	21.23	2.44	15.87	41.31	0.37	1.92	5.33	14.33	57.36	70.56
T_{10}	5.15	21.91	2.47	16.29	42.35	0.39	1.94	5.41	14.67	57.36	70.96
T_{11}	5.15	22.52	2.47	16.64	40.65	0.39	1.99	5.42	15.00	57.68	72.18
T_{12}	5.21	22.77	2.50	17.42	39.69	0.41	2.03	5.42	15.00	57.70	72.84
T_{13}	5.21	23.70	2.50	17.90	41.83	0.42	2.08	5.42	15.25	57.76	73.29
T_{14}	5.25	24.03	2.54	18.53	42.57	0.43	2.12	5.45	15.67	58.01	73.34
T_{15}	5.27	24.64	2.57	19.66	40.83	0.46	2.16	5.66	16.00	58.09	75.77
CD (P=0.05)		1.18		3.43		0.38	0.45		0.63		1.27









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Citation : Sharma A., Bhatnagar P., Singh J., Sharma M.K. and Jain M.C. (2016). Growth and physiological correlations in custard apple cv. Raidurg under consortium of vermicompost and PSB. *HortFlora Res. Spectrum,* **5**(2) : 89-98.