

Effect of organic nutrients on growth and essential oil content of sweet basil (*Ocimum basilicum* L.)

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ABSTRACT

An investigation was carried out to find out the effect of different organic manures viz., FYM, vermicompost, *Azospirillum*, phosphobacteria, panchagavya, neemcake and inorganic fertilizers (120: 120: 100 kg of NPK ha⁻¹) on the growth and essential oil content of sweet basil. Among the different treatment combinations, application of FYM @ 25 t / ha + *Azospirillum* + phosphobacteria + panchakavya 3 per cent as foliar spray recorded highest plant height, number of branches and fresh weight of the herb per plant in sweet basil.

Key words : Sweet basil, Growth, Essential oil, FYM, Vermicompost, Panchagavya

Basil is the popular name given to any aromatic herb belonging to the genus *ocimum*. *Ocimum basilicum* L. is also called as sweet basil or common basil (Singh and Ramesh, 2002). It posses glandular hairs with stalked or sessile glands which secrete strongly scented volatile oils. Several chemotypes of basil are methyl cinnamate or methyl chavicol or euginol and linalool types. Methyl chavicol is used for multiple applications, like flavouring confectioneries and bever-ages. The sweet basil oil posses antibacterial, antifungal, insecticidal, antiseptic and disinfectant (Anwar *et al.*, 2005). Application of organic manures along with inorganic nutrients is economic in the long run as well as environmental friendly. Hence, the present study was carried out to find out the effect of organic nutrients on growth and essential oil content of sweet basil.

MATERIALS AND METHODS

The experiment was conducted as pot study in completely randomized block design with 14 treatments in three replications during 2007-2009 at orchard, Department of Horticulture, Faculty of Agriculture, Annamalai University. The soil type was clay loam, pH of the soil was 7.5, EC of 0.67 dsm⁻¹ and available N was 210.5 kg ha⁻¹, P was 10.3 kg ha⁻¹ and k was 249.4 kg ha⁻¹. Treatments consisted of two organic manures, Farm yard manure and vermicompost at two different levels and bio-fertilizers (*Azospirillum* and Phosphobacteria) along with panchagavya 3 per cent and neem cake 20 per cent as foliar spray. The following are the treatments T₁ – FYM @ 12.5 t ha⁻¹+*Azospirillum* and

Phosphobacteria @ 2 kg ha⁻¹, T₂ – FYM @ 25 t ha⁻¹+ *Azospirillum* and Phosphobacteria @ 2 kg ha⁻¹, T₃ – Vermicompost @ 2.5 t ha⁻¹+*Azospirillum* and Phosphobacteria @ 2kg ha⁻¹, T₄ – Vermicompost @ 5 t ha⁻¹+ *Azospirillum* and Phosphobacteria @ 2 kg ha⁻¹, T₅ – T₁ + Panchagavya @ 3% foliar spray, T₆ – T₂ + Panchagavya @ 3% foliar spray, T₇ – T₃ + Panchagavya @ 3% foliar spray, T₈ – T₄ + Panchagavya @ 3% foliar spray, T₉ – T₁ + Neemcake extract @ 20% foliar spray, T₁₀ – T₂ + Neemcake extract @ 20% foliar spray, T₁₁ – T₃ + Neemcake extract @ 20% foliar spray, T₁₂ – T₄ + Neemcake extract @ 20% foliar spray, T₁₃ – Recommended dose of inorganic fertilizer (120: 100: 100 kg ha⁻¹), T₁₄ – Control. The observations recorded were plant height, number of branches and essential oil content of the herb per plant.

RESULTS AND DISCUSSION

The data on the effect of organic nutrients on the plant height of sweet basil are presented in Table 1. Statistically significant differences were observed among the treatments in season-I and season-II. In season-I among the different treatments T₆ exhibited the highest plant height of (64.11cm), followed by T₁₃ (62.53 cm) and T₁₂ (58.50 cm). In season-II, also the similar trend was observed with T₆ recording the highest plant height of (63.21 cm), followed by T₁₃ (59.12 cm) and T₁₂ (57.25 cm). The minimum plant height was recorded in T₁₄ (Absolute control) 53.53 and 49.76 cm in both the seasons, respectively. Among the two seasons season-I recorded highest plant height than season –II irrespective of the

Table 1 : Effect of organic nutrients on plant height in sweet basil (*Ocimum basilium* L.)

Treatments	Plant height (cm)	
	Season I	Season II
T ₁ - FYM @ 12.5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	54.89	52.13
T ₂ - FYM @ 25 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	55.21	54.84
T ₃ - Vermicompost @ 2.5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	53.13	52.93
T ₄ - Vermicompost @ 5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	55.00	54.34
T ₅ - T ₁ + Panchagavya @ 3% foliar spray	56.83	55.38
T ₆ - T ₂ + Panchagavya @ 3% foliar spray	64.11	63.21
T ₇ - T ₃ + Panchagavya @ 3% foliar spray	56.13	55.42
T ₈ - T ₄ + Panchagavya @ 3% foliar spray	57.80	56.00
T ₉ - T ₁ + Neemcake extract @ 20% foliar spray	55.33	54.93
T ₁₀ - T ₂ + Neemcake extract @ 20% foliar spray	55.93	53.99
T ₁₁ - T ₃ + Neemcake extract @ 20% foliar spray	55.34	54.28
T ₁₂ - T ₄ + Neemcake extract @ 20% foliar spray	58.50	57.25
T ₁₃ - Recommended dose of inorganic fertilizer (120: 100: 100 kg ha ⁻¹)	62.53	59.12
T ₁₄ - Control	53.53	49.76
S.E. ±	0.41	0.90
C.D. (P=0.05)	0.82	1.80

treatments.

Organic manures improve the soil physical conditions and promote microbial and soil organic matter, which in turn produces organic acids, which inhibits enzymes, particularly IAA oxidase resulting in enhancing the promotive effect of auxin –IAA which has direct effect on plant growth (Leopold, 1974).

The results presented in Table 2, showed the effect of organic nutrients on the production of branches in sweet basil. In both harvests all the treatments exhibited significant influence over the number of branches

produced per plant. Among the different treatments, the treatment T₆ recorded the maximum number of branches per plant (35.86), followed by T₁₃ (34.38) and T₁₂ (33.94) in season-I. The same treatment also performed better in season-II and the maximum number of branches per plant (32.99) were recorded in the treatment T₆, followed by T₁₃ (32.65) and T₁₂ (31.80). The treatment T₁₄ (Absolute control) produced the minimum number of branches per plant (26.42 and 25.24) in both the seasons. Among the two seasons, irrespective of the treatments, the performance with regard to the production of branches

Table 2 : Effect of organic nutrients on number of branches in sweet basil (*Ocimum basilium* L.)

Treatments	Number of branches per plant	
	Season I	Season II
T ₁ - FYM @ 12.5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	29.40	27.24
T ₂ - FYM @ 25 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	30.26	27.66
T ₃ - Vermicompost @ 2.5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	28.24	25.42
T ₄ - Vermicompost @ 5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	29.87	27.43
T ₅ - T ₁ + Panchagavya @ 3% foliar spray	32.98	30.28
T ₆ - T ₂ + Panchagavya @ 3% foliar spray	35.86	32.99
T ₇ - T ₃ + Panchagavya @ 3% foliar spray	32.14	30.46
T ₈ - T ₄ + Panchagavya @ 3% foliar spray	33.24	31.28
T ₉ - T ₁ + Neemcake extract @ 20% foliar spray	30.76	29.64
T ₁₀ - T ₂ + Neemcake extract @ 20% foliar spray	31.54	30.18
T ₁₁ - T ₃ + Neemcake extract @ 20% foliar spray	31.94	29.43
T ₁₂ - T ₄ + Neemcake extract @ 20% foliar spray	33.94	31.80
T ₁₃ - Recommended dose of inorganic fertilizer (120: 100: 100 kg ha ⁻¹)	34.38	32.65
T ₁₄ - Control	26.42	25.24
S.E. ±	0.024	0.30
C.D. (P=0.05)	0.048	0.60

Table 3 : Effect of organic nutrients on essential oil content in sweet basil (*Ocimum basilium* L.)

Treatments	Essential oil content (%)	
	Season I	Season II
T ₁ - FYM @ 12.5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	0.31	0.29
T ₂ - FYM @ 25 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	0.32	0.30
T ₃ - Vermicompost @ 2.5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	0.31	0.28
T ₄ - Vermicompost @ 5 t ha ⁻¹ + <i>Azospirillum</i> and Phosphobacteria @ 2 kg ha ⁻¹	0.31	0.28
T ₅ - T ₁ + Panchagavya @ 3% foliar spray	0.33	0.31
T ₆ - T ₂ + Panchagavya @ 3% foliar spray	0.38	0.36
T ₇ - T ₃ + Panchagavya @ 3% foliar spray	0.32	0.30
T ₈ - T ₄ + Panchagavya @ 3% foliar spray	0.34	0.32
T ₉ - T ₁ + Neemcake extract @ 20% foliar spray	0.32	0.30
T ₁₀ - T ₂ + Neemcake extract @ 20% foliar spray	0.34	0.32
T ₁₁ - T ₃ + Neemcake extract @ 20% foliar spray	0.32	0.30
T ₁₂ - T ₄ + Neemcake extract @ 20% foliar spray	0.35	0.33
T ₁₃ - Recommended dose of inorganic fertilizer (120: 100: 100 kg ha ⁻¹)	0.36	0.34
T ₁₄ - Control	0.22	0.22
S.E. ±	0.02	0.02
C.D. (P=0.05)	0.01	0.01

was best in season-I.

Application of FYM resulted in lowering of pH, and CEC and exchangeable cations. It has several other beneficial effects on soil microorganisms and chemical properties of soil (Singh *et al.*, 1980). Rayar (1987) reported that the application of organic manures like FYM to soil significantly increased total and available nitrogen.

The data on oil content in herbage as influenced by organic nutrients are presented in Table 3. The highest oil content was recorded in T₆ (0.38 %) which was followed by T₁₃ (0.36 %) and T₁₂ (0.35 %) while lowest was recorded in control T₁₄ (0.22 %) in season-I. In the season-II, the treatment T₆, T₁₃ and T₁₂ registered the maximum oil content (0.36 %, 0.34 % and 0.33 %, respectively). The control (T₁₄) registered the lowest oil content (0.22 %). While comparing the two season, season-I was found to register the highest essential oil content than season-II in all the treatments.

The essential oil content is an important parameter that determines the oil yield of sweet basil. Essential oil is synthesized from products of photosynthesis through enzymatic actions. Higher oil recovery had resulted in the increase in number of leaves as well as number of inflorescence. A positive correlation between increased leaf yield and oil content was reported by Nehra *et al.* (1981) and Arularasu and Sambandamurthi (1999) in Tulsi. The soil with its content in macro and micro elements, enhanced by the use of organic fertilizers, plays an essential role in the plant growth and development and also it can be noted that the vegetative mass is rich and

the amount of essential oil is high when using organic manures (Khalid *et al.*, 2006).

Based on the consistent result obtained as above and taking into consideration of the favourable affects on growth attributes and essential oil content, application of FYM @ 25 t ha⁻¹ + *Azospirillum* + Phosphobacteria + Panchagavya @ 3 per cent foliar spray given thrice at 30, 45 and 60 DAP can be adjudged as the best treatment combination to maximize growth and essential oil content in sweet basil. In general, the growth and essential oil content was comparatively more in crop when sweet basil was raised during season-I (July- October) as compared to season-II (January –April) summer season.

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