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Influence of Foliar Application of Seaweed Extract and Plant Growth Regulators on Growth and Physiological Attributes of *Jasminum sambac*

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Abstract An investigation was carried out to determine the influence of foliar application of sea weed extract and plant growth regulators on growth and physiological attributes of *Jasminum sambac*. The observations on growth and physiological parameters viz., highest plant height (128.64 cm), Number of primary shoots (12.91), Number of secondary shoots (13.71), Number of leaves / plant (268.24), Number of productive shoots (59.67), Leaf area (32.56 cm^2), and Chlorophyll content (2.94 mg/g) was achieved in the treatment of T_9–Sea weed extract @ 5%. The results indicated that the foliar spray of sea weed extract at 5% recorded the best response over the control.

Keywords Sea weed extract, Plant growth regulators, Growth attributes, Physiological response, *Jasminum sambac.*

Introduction

Jasminum sambac Ait. (Gundumalli) is one of the most important commercial traditional flower crops of South India belonging to the family Oleaceae. It is considered as a spiritual flower since time immemorial. It is also an important source of jasmine concrete and perfume extraction. Jasmine concrete is now being produced industrially in India and it is a highly profitable venture and the demand is increasing in the world market because of its unique fragrance which cannot be imitated by synthetic chemicals.

Sea weeds are marine algae, saltwater dwelling, and simple organisms that fall into the rather outdated general category of plants. Most of them are the red (6000 species), brown (2000 species) or green (1200 species). A wide range of beneficial effects have been reported from the use of liquid seaweed extracts Blunden [1], including increased crop yields, resistance of plants to frost, increased uptake of inorganic constituents from the soil, more resistance to stress conditions. The information on the role of seaweed as a source of nutrients and as a growth promoting substance has also been established by Data and co-workers [2], Saravanan and co-workers [3] and Shankar and co-workers [4]. Seaweed extract and Plant Growth Regulators (promoters, inhibitors or retardants) play major role in contributing internal mechanism of plant growth by interacting with key metabolic processes such as nucleic acid metabolism and protein synthesis. Growth retardants are known to reduce inter nodal distance thereby enhancing source–sink relationship.

Materials and Methods

The present investigation was under taken to study the Influence of Foliar Application of Seaweed Extract and Plant Growth Regulators on Growth and

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Table 1. Chemical composition of seaweed extract.

Nutrients	Content
Nitrogen (N)	0.18%
Phosphorus (P_2O_5)	0.48%
Potassium (K_2O)	1.89%
Calcium	0.11%
Magnesium	0.01%
Sodium	0.13%
Iron	256.0 ppm
Zinc	11.87 ppm
Copper	15.62 ppm
Manganese	13.12 ppm
Growth hormones : Cytokinin, Auxin, Gibberelin	Trace

physiological attributes of *Jasminum sambac*. The experiment was laid out in randomized block design (RBD) with ten treatments and three replications. The chemical composition of the Sea Weed Extract is presented (Table 1). Observations on growth and physiological attributes viz., plant height, Number of primary shoots, Number of secondary shoots, Number of leaves/plant, Productive shoots, Leaf area (cm^2) and chlorophyll content were recorded. The data on various characteristics were subjected to statistical analysis as per the method suggested by Gomez and Gomez [5]. The following treatments were included in the study.

Treatment details
T_1–TIBA 20 ppm, T_2–TIBA 40 ppm, T_3–BA 20 ppm, T_4–BA 40 ppm, T_5–NAA 20 ppm, T_6–NAA 40 ppm, T_7–Sea weed extract @ 2%, T_8–Sea weed extract @ 3.5%, T_9–Sea weed extract @ 5%, T_{10}–Control

Results and Discussion

The results (Table 2) indicated that highest plant height was recorded in T_9 (128.64 cm) i.e. Sea weed extract @ 5% in comparison to the lowest plant height recorded in the control (76.76 cm). This might be due to the presence of macro and micro nutrients as well as growth promoting substances like auxin and cytokinin in sea weed extracts. These results were supported by Zodape and co-workers [6], who showed that application of sea weed extract with lower concentration had significantly increased plant height of tomato, while higher concentration exhibited inhibitory effect than control plants. Similar results have been reported in *Vigna sinensis* L. by Sivashankari [7].

The number of primary shoots were highest in T_9 (12.91) i.e. Sea weed extract @ 5% in comparison to the lowest number of primary shoots were recorded in the control (6.18). The number of secondary shoots were highest in T_9 (13.71) i.e. Sea weed extract @ 5% in comparison to the lowest number of secondary shoots recorded in the control (8.31). The number of leaves per plant were highest in T_9 (268.24) i.e. Sea weed extract @ 5% in comparison to the lowest number of leaves per plant recorded in the control (6.18). The big difference in the number of leaves on the plant-treated with extracts and without the extract indicates the effect of seaweed extracts on the number of leaves of crop plants. This phenomenon may be due to the presence of active compounds, micro-and macro nutrients in the extract of seaweeds (macroalgaes), which can stimulate plant growth reported earlier. Previously, it was suggested that various species of marine algae found in nature or commercially cultivated contain organic compounds which activity resemble the activity of a cytokinin, auxin and gibrellin. These compounds were able to stimulate growth as a result of enhancement of protein synthesis and cell division, and the mobilization of nutrients needing for growth.

The leaf area was highest in T_9 (32.56) i.e. Sea weed extract @ 5% in comparison to the lowest number of leaves per plant recorded in the control.(18.34). The highest number of productive shoots were recorded in T_9 (59.69) i.e. Sea weed extract @ 5% in comparison to the lowest number of leaves per plant recorded in the control (34.46). The chlorophyll content was highest in T_9 (2.94) i.e. Sea weed extract @ 5% in comparison to the lowest chlorophyll content recorded in the control (1.49). Sea weeds and sea weed products enhances chlorophyll content. As reported earlier that application of a lower concentration of sea weed extract to soil or on foliage of tomatoes produced leaves with higher chlorophyll content than those of untreated controls. Further, this increase in chlorophyll content was a result of reduc-

Table 2. Influence of plant growth regulators and sea weed extract on growth and physiological attributes in *Jasminum sambac*.

Treatments	Plant height (cm)	Number of primary shoots	Number of secondary shoots	Number of leaves/ plant	Productive shoots	Leaf area (cm^2)	Chlorophyll content
T_1	81.62	6.46	8.43	52.64	36.64	19.62	1.85
T_2	88.17	7.29	8.69	80.32	40.34	21.42	1.63
T_3	91.26	7.63	9.23	93.34	41.68	22.75	1.72
T_4	98.34	8.43	9.78	131.86	44.90	23.94	1.93
T_5	111.49	10.02	11.11	198.64	51.26	27.39	2.30
T_6	114.64	11.36	12.16	211.67	52.46	28.16	2.39
T_7	104.88	10.21	10.56	167.86	48.31	25.54	2.01
T_8	121.89	11.16	11.45	239.71	55.42	30.91	2.74
T_9	128.64	12.91	13.71	268.24	59.67	32.56	2.94
T_{10}	76.76	6.18	8.31	51.30	34.46	18.34	1.49
SEd	2.51	0.23	0.25	4.21	1.15	0.61	0.05
CD (0.05)	5.27	0.48	0.53	8.86	2.41	1.29	0.11

tion in chlorophyll degradation, which might be caused in part by betaines in the seaweed extract. Nagaraj and co-workers [8] proposed that there is a positive correlation between photosynthetic rate and chlorophyll content and small drop in chlorophyll content causes drastic reduction in photosynthetic rate. The increase in the growth variable used of seaweed extract treated plant may be due to fact that enhanced the uptake of magnesium, phosphorus, potassium, nitrate and iron. Physiological responses due to sea weed extract spray include improved nutrient mobilization and partitioning, the development of a vigorus root system, increased chlorophyll content and leaf area. In the present study, application of seaweed extract enhanced plant growth parameters. Such enhancement in growth parameters could be attributed to either improvement in soil condition resulting in greater root growth thereby enhancing the utilization of soil nutrients.

Growth retardants are either slow down the cell division, or inhibit the cell elongation. These are mainly used because of their retarding effects on shoot growth, breaking apical dominance which induce dwarf and bushy plants and increase the number of lateral branches.

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