

Effect of Date Palm Compost and Brassinolides on Growth and Flowering *Tecoma stans* L.

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Abstract

The experiment was conducted at the research station of the College of Agriculture, University of Kufa, during the 2024-2025 growing season, to evaluate the effect of using soil amendment with date palm remains compost and foliar Brassinolides on *Tecoma* growth and flowering. *Tecoma* seedlings were 6-month-old yellow Stans propagated by cuttings and planted in plastic bags. The treatments were: soil incorporations with date palm remain compost at 0, 100, 200 and 300 g. pot-1 and foliar treatment with Brassinolide at 0, 5, 10 and 15 mg L-1. Date palm compost was added once at transplanting in 26 cm dia. pots while Brassinolide was sprayed three times during the experiment period. The results showed that soil treated with 300 g. pot-1 of date palm waste compost or spraying the seedlings with Brassinolide at 15 mg. L-1 resulted in higher values of increase in plant height, stem diameter, number of branches, inflorescence length, number of inflorescences, florescence diameter, and plant content of chlorophyll, auxin and Brassinolide. In general, it was found that the interaction treatment of 300 g. pot-1 compost and 15 mg. L-1 foliar Brassinolide led to the highest significant values in the increase of plant height (42.33 cm), number of branches (5.66 branch. plant-1), main stem diameter (5.20 mm), inflorescence length (19.43 cm), leaf content of Brassinolide (2.80 µg. g-1). While the same compost level interacted with 10 mg. L-1 foliar Brassinolide resulted in the highest number of inflorescence (7.66 inflorescences. Plant-1), florescence diameter (2.46 cm), leaf content of chlorophyll (20.18 mg. 100g-1 FW) and auxin (3.06 µg. g-1) showing significant difference from the other interactions and the control treatment.

Keywords: organic fertilization, ornamentals, plant hormones, soil amendments

Introduction

Tecoma stans, a plant in the Bignoniaceae plant family, comprises 14 species, including the genus *Tecoma*. It is a globally important ornamental shrub with bright yellow, funnel-shaped flowers with a slight scent, borne in short clusters. It is native to tropical and subtropical regions of Central and South America and India (20). The plant is hardy and resistant to various conditions. It grows on an erect, branched stem with small branches, reaching a height of 2–4 m. Its leaves are opposite, pinnate, green, and serrated, as each leaf consists of 4–5 lanceolate or oblong

leaflets (7). In order to increase flowering and flower quality in *Tecoma* seedlings, it is necessary to implement agricultural practices and modern techniques to improve plant growth and increase its production of high-quality flowers (10). One of the most important agricultural processes is the use of growth regulators with multiple effects to regulate and modify plant biological processes (19). Brassinolides are modern growth regulators characterized by their high capacity to stimulate cell wall biosynthesis, branch growth, adventitious root formation, and

flowering (8). Laboratory experiments have demonstrated the significant role of brassinolides in inducing numerous physiological changes within plant tissues, accompanied by morphological transformations (3, 4, 8). They also play a significant role in influencing and contributing cell division and elongation, the biosynthesis of cell wall components, and flowering (11.)

In the context of clean agriculture, the use of palm waste has received significant attention from agricultural experts, being economically affordable with low cost beside their advantage as friendly environment products that can be used to improve plant growth and yield (13). Palm tree waste contains nutrients beneficial to plants at all growth stages, leading to an increase in both quantitative and qualitative growth, as well as increasing the nutrient efficiency and reducing environmental pollution (14). Organic matter contributes to providing plants with nutrients and increasing their protein and vitamin content Organic fertilizers are important in providing key nutrients such as nitrogen and potassium, as well as trace elements, to meet plant needs throughout their life cycle (9). Organic matter plays a significant role in

Table 1. physical and chemical properties of the soil used in the study

Value	Unit	Properties
7.6	pH	Soil reaction rate
7.2	dS m ⁻¹	Electrical conductivity EC
30.9	mg L ⁻¹	Nitrogen N
12.3	mg L ⁻¹	Phosphorus P
14.7	mg L ⁻¹	Potassium K
12.9	%	CaCO ₃
2.2	%	Organic matter
Sandy-clay loam		Soil texture

improving soil porosity, regulating water and air movement, gas exchange, increasing soil water holding capacity, raising cations exchange capacity, and lowering soil pH (1). This study aimed to determine the effect of fertilizing with date palm remains compost and the plant hormone brassinolides on Tecoma growth and flowering.

Materials and Methods

The experiment was conducted at the Agricultural Research Station of the College of Agriculture - University of Kufa in a house covered with green mesh with a shade percentage of (25%) during the agricultural season 2024-2025. The response of Tecoma plant to the addition of decomposed palm waste and spraying with brassinolide was tested in terms of vegetative, floral and chemical growth indicators. The seedlings were transferred on September 15, 2024, into plastic pots with a diameter of (25 cm) and a height of (28 cm) containing a culture medium consisting of soil and peat moss at a ratio of 1:3. Samples of the soil used in agriculture were analyzed and their chemical and physical properties and suitability for agriculture were determined (Table 1.)

The treatments included two factors: the first was treating the potting soil once with palm waste compost at four levels (0, 100, 200 or 300 g. pot⁻¹), and the second factor was spraying the seedlings with Brassinolide at four concentrations (0, 5, 10, or 15 mg. L⁻¹). Brassinolide was sprayed three times, the first on 15/10/2024 (one month after transplanting the seedlings), then the second and third sprayings after an interval of 21 days. The plants were sprayed early in the morning until completely wet using a 2-litter hand sprayer. A barrier was placed between the treatments and the experimental units. Plant maintenance was carried out by watering and weeding all treatments as needed.

Study measurements

Data were collected for vegetative growth parameters: the increase in total number of leaves (leaf/plant⁻¹), increase in plant height (cm), increase in number of branches (branches plant⁻¹). As for floral growth parameters they included: inflorescence length (cm), floret diameter (cm), number of florets per inflorescence. Some qualitative chemical parameters were also assessed including: leaf chlorophyll content (mg.100g⁻¹ FW) calculated in the fourth leaf from the growing tip using a Spectrophotometer, leaf content of Brassinolide and Auxin (mg. g⁻¹) (15.)

Experiment design and data analysis

The experimental treatments included all possible interactions were distributed for the two factors to nine treatments with three replications as Randomized Complete Block Design (RCBD) six seedlings per experimental unit (17). The experiment data were collected and subjected to data analysis, where analysis of variance ANOVA was performed using the computing statistical program GenStat 12th (22). Differences among the treatment's means were compared according to the least significant difference (L.S.D) at a probability level of 0.05.

Results and Discussion

It was noted from the results of Table (2) that treating the potting soil with palm remain compost at 300 g. pot⁻¹ led to a significant increase in vegetative indicators with an increase in the plant height, stem diameter and number of branches, as the latter did not differ in most cases from the values recorded using 200 g pot⁻¹ treatment, but significantly differed from that at the level of 100 g and the control. As for the effect of the plant hormone, it was noted that the highest values were recorded in the spraying Brassinolide at 15 mg. L⁻¹ compared to using solution of lower concentrations. In general, interaction treatment of Brassinolide 15 mg. L⁻¹ and 300 g. pot⁻¹ palm remain compost resulted in the highest values for the average increase in plant height (42.33 cm), stem diameter (5.20 mm) and number of branches (6.00 branches. plant⁻¹) compared to all other treatments that recorded values ranging from 24.30-40.57 cm, 1.16-5.13 mm and 2.66-5.66 branch. plant⁻¹, respectively.

The findings indicate that, the plant floral parameters were also affected by the study factors. An increase in the inflorescence length value was observed with increasing the level of palm waste compost fertilization at 300 g. pot⁻¹, especially in interaction with foliar spraying with Brassinolide at the highest concentration (15 mg/L), which recorded an inflorescence length of 19.43 cm, which did not differ from that recorded in the presence of 10 mg. L⁻¹ Brassinolide at the same level of organic fertilization. However, it was found that the highest value for the number of inflorescences (7.66 inflorescences. Plant⁻¹) and inflorescence diameter (2.46 cm) was found with spraying with 10 mg/L brassinolide at the highest fertilization level of 300 g pot⁻¹, which did not differ from that recorded

Table 2. Tecoma stans L. vegetative growth parameters as affected by Date palm compost application and foliar spraying with Brassinolides

Brassinolide at 5, 10 and 15 mg L ⁻¹	Date palm compost (g. pot ⁻¹ soil)	Increase in plant height (cm)	Increase in stem diameter (mm)	No. of branches (Branch. plant ⁻¹)
Control (0)	0	24.30	1.16	3.66
	100	25.10	2.46	2.66
	200	28.37	2.53	3.66
	300	37.67	3.16	4.66
5	0	24.60	2.20	3.66
	100	35.77	2.30	3.33
	200	39.27	3.53	4.66
	300	37.70	3.50	5.66
10	0	37.27	2.23	3.66
	100	37.37	3.30	4.33
	200	40.227	2.50	4.66
	300	40.57	5.13	6.00
15	0	33.35	2.60	3.33
	100	34.80	3.46	4.66
	200	40.33	3.40	4.33
	300	42.33	5.20	5.66
LSD (P≤0.05)	Bras./compost	1.44	0.130	0.465
	Interaction	2.288	0.282	0.930

Table 3. Tecoma stans L. floral growth parameters as affected by Date palm compost application and foliar spraying with Brassinolides

Brassinolide at 5, 10 and 15 mg L ⁻¹	Date palm compost (g pot ⁻¹ Soil)	Inflorescence length (cm)	No. of inflorescences (inflorescences plant ⁻¹)	Florescence plant diameter (cm)
Control (0)	0	10.20	3.66	1.13
	100	11.23	4.66	1.13
	200	12.23	3.66	1.13
	300	14.20	4.33	1.33
5	0	10.20	5.00	1.16
	100	17.20	4.33	1.16
	200	17.40	4.33	1.16
	300	19.23	7.33	2.13
10	0	15.20	2.66	1.16
	100	17.20	4.33	1.23
	200	18.66	5.66	1.26
	300	18.20	7.66	2.46
15	0	17.33	4.66	1.16
	100	17.13	4.66	1.36
	200	18.20	5.33	1.43

	300	19.43	7.33	2.16
LSD ($P \leq 0.05$)	Bras./compost	0.994	0.512	0.049
	Interaction	0.198	1.024	0.098

with spraying with 15 mg L⁻¹. At the same level of organic fertilization, although significant differences ($P \leq 0.05$) were recorded compared to most of the interactions and individual treatments (Table 3 .(

It was also observed that palm remain compost at 300 g. pot⁻¹ led to a significant increase in leaf content of chlorophyll, Brassinolide and auxin (Table 4). Especially, in the interaction treatment with 15 mg. L⁻¹ Brassinolide, which recorded the highest total chlorophyll 20.18 mg 100 g⁻¹ FW, and Auxin 2.84 µg g⁻¹, while, the highest level of leaf Brassinolide was 2.80 µg g⁻¹ recorded in plant sprayed with 10 mg. L⁻¹ Brassinolide in the presence

of 300 g. pot⁻¹ compost. Although they did not differ in most cases from the values recorded in the compost treatments at 200 g pot⁻¹, but differed significantly from those recorded using the 100 g pot⁻¹ level and the control (Table 4). In general, it was observed that the highest values of leaf chlorophyll, Brassinolide and auxin were recorded in the treatment sprayed with Brassinolide at 15 mg. L⁻¹ compared to lower concentrations of the spray solution. It was also noted that within the same treatment of foliar Brassinolide, the values increased significantly in most cases with increasing the level of organic fertilizer from 100-300 g pot⁻¹.

Table 4. Tecoma stans L. contents of biochemical traits as affected by Date palm compost application and foliar spraying with Brassinolides

Brassinolide (mg L ⁻¹)	Date palm compost (g pot ⁻¹)	Leaf content of bio-chemicals		
		Total chlorophyll mg 100g ⁻¹ FW	Brassinolide µg g ⁻¹	Auxin µg g ⁻¹
Control (0)	0	12.28	0.44	0.13
	100	12.58	0.45	0.17
	200	13.32	0.51	0.84
	300	14.50	1.63	0.35
5	0	12.45	0.47	0.15
	100	13.42	0.65	0.81
	200	14.59	0.62	1.28
	300	17.67	1.32	3.25
10	0	13.58	0.54	0.21
	100	14.89	0.68	1.23
	200	15.87	1.05	1.38
	300	19.78	1.42	3.05
15	0	13.81	0.67	0.37
	100	16.52	0.83	0.86
	200	16.48	1.95	2.43
	300	20.18	2.80	2.84
LSD ($P \leq 0.05$)	Bras./compost	1.74	0.223	0.326
	Interaction	2.322	0.362	0.462

The results indicate that the palm waste compost used in this study significantly increased vegetative, floral, and chemical growth indicators. This is likely due to the palm wastes content of essential plant growth nutrients, such as nitrogen, phosphorus, and potassium, which are readily available and important for photosynthesis, plant food production, vegetative and chemical growth (18).

In general, increased Nitrogen availability leads to an increase in protoplasm mass and, consequently, cell division and the formation of new tissues, leading to an increase in plant height and number of branches and leaves (5, 21). Increasing organic matter in plant soil contributes to regulating the osmotic and water potential of the cell, thereby increasing the cell's ability to draw water and nutrients from the growth medium, leading to increased leaf carbohydrate and chlorophyll content (12). In addition, palm compost plays a role in increasing vegetative growth, thereby increasing and enhancing the efficiency of photosynthesis, increasing the synthesis and accumulation of nutrients in plant parts, and thus improving various floral indicators (12, 21). Spraying plants with brassinolides also clearly had an effect in increasing vegetative and chemical growth indicators due to brassinolides' role in carbon metabolism and providing the energy needed for the formation of new cells, which increases plant height and growth (4). This was mostly reflected in the increased number of leaves and branches of the Tecoma plant when brassinolides were sprayed. This confirms the effect of brassinolides in increasing plant uptake of nutrients, which contain most of the elements important for vegetative and root growth, both in length and volume. This helps increase mineral absorption from the soil and NPK accumulation in the plant (8). The study results are consistent with recent once reported that spraying brassinolides on geranium Pelargonium cucullatum plants increased vegetative growth indicators, including plant

height, stem diameter, number of leaves, and dry weight of the vegetative system (2).

Findings showed that floral traits were positively affected by the organic compost incorporated with potting soil. Organic matter is important for photosynthesis and plant nutrition to increase vegetative growth and branching, thus increasing the number of flower buds in the plant (10). Nitrogen, potassium, and phosphorus in the organic compost are essential components of proteins, enzyme cofactors, and nucleic acids (DNA, RNA, and tRNA). They stimulate formation of cytokinins and promote rapid cell division and growth, thereby stimulating lateral branching and increasing the number of flower buds (19). This is consistent with a previous study showing that spraying the Roselle (*Hibiscus sabdariffa*) plant with brassinolide significantly increased flower growth indicators, including flower diameter, inflorescence length, and inflorescence number (3). Spraying brassinolides improved floral growth parameters, indicating that they stimulate cell divisions in the plant through a hormone-like mechanism of action, which positively impacted floral growth. Brassinolides facilitated the translocation of sugars and proteins produced in the leaves and their accumulation in the flower growth areas (4, 16). The increased inflorescence number resulting from spraying brassinolides may be due to the improved total protein and carbohydrate content in the leaves, which indirectly leads to the accumulation of these biochemicals in the consumption areas, and their potential to improve floral growth parameters (6). In the same context, it was indicated that treatment with brassinosteroids led to a significant increase in the activity of the ATPase enzyme that stimulates the Carboxylase enzyme responsible for increasing the soluble protein, which consequently increases the processes of construction, cell division and elongation, and then increases the growth of flowers (23).

Conclusion

Findings of this study showed that potting soil treated with 300 g. pot⁻¹ of date palm waste compost always resulted in higher values of the growth and floral indicators studied in Tecoma plants. Similar effects were also found when using foliar Brassinolide especially when used at 15 mg. L⁻¹ which did not differ much from 10 mg. L⁻¹. Most of indicators including increase of plant height,

leaf area and number of branches, number of florets per inflorescence, flower diameter, and leaf content of auxin and Brassinolide, were recorded their highest values in the interaction treatment of 15 mg. L⁻¹ foliar Brassinolide and date palm compost at level of 300 g. pot⁻¹. This combination, in conclusion, can be very feasible and effective for increasing Tecoma flowering and flower quality .

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