Research Article

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Influence of thiourea on growth parameters of jackfruit (*Artocarpus heterophyllus* L.)

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ABSTRACT

The experiment was conducted during the year 2022-23 at the Department of Fruit Science, College of Horticulture and Forestry, Jhalrapatan, Jhalawar to investigate the effect of thiourea on growth and development of jackfruit cv. Chandra. The study consisted of nine treatments, arranged in a Randomized Block Design with three replications. Among the various treatments, the application of 2.0% Thiourea (T_8) to individual plants was found to be significantly superior to the other treatments in terms of growth parameters, including plant height (17.84%), rootstock girth (21.82%), scion girth (21.34%), number of leaves per plant (26.55%), and leaf area (32.88%).

Introduction

The jackfruit (*Artocarpus heterophyllus* L.) is an important fruit tree widely cultivated in tropical and subtropical regions, particularly in South-East Asia. With a basic chromosome number of 14, jackfruit is native to the Western Ghats of India. It is often referred to as the "poor man's fruit" in the eastern and southern parts of India due to its affordability and nutritional value. The jackfruit is an evergreen tree that produces separate male and female inflorescences on the same plant, exhibiting a unique cauliflorous bearing habit where female flowers grow directly on the trunk. In eastern India, tender jackfruit is widely used as a vegetable.

The rind of jackfruit is rich in protein, with its principal protein, "jacalin," having been extracted and studied. According to the Ministry of Agriculture and Farmers Welfare (2021-22) 3rd advance estimate, jackfruit is cultivated on 1.88 lakh hectares in India, producing 19.46 lakh metric tonnes annually (Anonymous, 2021-22). Its versatility and wide range of uses make jackfruit an important species for research, particularly in enhancing nutrition and supporting income generation through agroforestry and home garden systems. Jackfruit is also suitable for diversification, thriving alongside other fruit crops like mango, litchi, and sapota. Furthermore, it can be cultivated independently in commercial orchards and has shown great adaptability when introduced to other parts of the world with suitable climates (Morton, 1965).

Thiourea, also known as Thiocarbamide, is a compound containing nitrogen (36.8%) and sulphur (42.1%). Its biologically significant functional groups make it a valuable exogenous application for promoting plant growth (Jocelyn, 1972). In the face of increasing atmospheric dryness, plant growth and development are severely affected. Thiourea has been shown to improve plant stress resistance, thereby enhancing growth and development, making its application particularly relevant and practical in current agricultural practices. Keeping in view the significance of thiourea, this investigation was undertaken to evaluate its effect on the various growth parameters of jackfruit (*Artocarpus heterophyllus* L.).

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Material and Methods

A field experiment was conducted from June 2022 to March 2023 at the Instructional Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalrapatan, Jhalawar, in a newly established plantation of Jackfruit (*Artocarpus heterophyllus* L.) cv. Chandra. One-year-old plants were selected for the study. The experiment was designed using a Randomized Block Design (RBD) with three replications. The treatments comprised of control (T_o) and eight concentrations of thiourea applied as foliar sprays viz., T_1-0.25%, T_2-0.50%, T_3-0.75%, T_4-1.00%, T_5-1.25%, T_6-1.50%, T_7-1.75% and T_8-2.00%. The foliar applications were performed during the second week of June, August, and October 2022 after recording the initial (baseline) growth and development parameters of the plants.

Observations on plant growth parameters, including plant height (cm), rootstock girth (mm), scion girth (mm), number of leaves per plant, and leaf area (cm^2), were initially recorded in June 2022. Subsequent measurements were taken at two-month intervals, continuing until March 2023. During the course of the experiment, three detailed observations were recorded in September, December, and March to evaluate the effects of thiourea on these growth parameters. This systematic approach allowed for the assessment of the progressive impact of the treatments over the experimental period.

The data collected during the experiment were statistically analyzed following the methods outlined by Panse and Sukhatme (1995). To clarify the efficacy of thiourea, percentage values were calculated based on the original recorded values across different growth periods. The percent values are provided in brackets alongside the corresponding recorded measurements, offering a clear representation of the relative changes observed during the study.

Result and Discussion

The foliar application of thiourea significantly impacted key growth parameters of jackfruit, including plant height, rootstock girth, scion girth, number of leaves per plant, and leaf area (Table 1, Fig. 1). Among the treatments, T_8 (Thiourea 2.0%) demonstrated the highest increase in plant height (17.84%; 107.46 cm), rootstock girth (21.82%; 22.05 mm), scion girth (21.34%; 21.55 mm), number of leaves per plant (26.55%; 41.33), and leaf area (32.88%; 39.35 cm^2) compared to the other treatments, including the control (T_o). The superior growth observed in treatment T_8 (Thiourea 2.0%) can be attributed to the action of thiourea, which enhances plant growth by regulating hormonal activity, promoting differentiation and morphogenesis, and supporting vital physiological processes like carbon and nutrient assimilation (Wahid *et al.*, 2017).

The notable improvement in leaf parameters under T_8 (Thiourea 2.0%) is likely due to the sulphur and nitrogen content in thiourea, which stimulates the meristematic activity of apical tissues and promotes cell division. This effect enhances shoot length and leaf area, which, in turn, improves light capture, carbohydrate synthesis, and overall plant growth (Pravin *et al.*, 2021).

Table 1. Effect of thiourea on growth parameters of jackfruit cv. Chandra during growth period

Treatments	Plant height (cm)*		Rootstock girth (mm)*		Scion girth (mm)*		No. of leaves/ plant*		Leaf area (cm^2)*	
	Initial value	Final value	Initial value	Final value	Initial value	Final value	Initial value	Final value	Initial value	Final value
T_0 (Control)	82.52	87.12 (5.57%)	16.67	18.00 (7.96%)	16.37	17.17 (4.87%)	33.33	36.33 (9.01%)	21.87	23.40 (7.03%)
T_1 (Thiourea 0.25%)	86.24	93.62 (8.55%)	18.84	20.80 (10.38%)	18.41	20.08 (9.07%)	34.33	38.00 (10.68%)	29.09	32.44 (11.53%)
T_2 (Thiourea 0.50%)	90.45	99.17 (9.64%)	16.71	18.67 (11.73%)	15.79	17.41 (10.26%)	33.00	36.66 (11.11%)	29.15	32.98 (13.13%)
T_3 (Thiourea 0.75%)	84.67	93.13 (9.99%)	18.01	20.17 (12.01%)	17.85	19.87 (11.30%)	33.33	37.66 (13.00%)	22.04	25.20 (14.32%)
T_4 (Thiourea 1.00%)	81.70	89.90 (10.03%)	17.59	19.80 (12.54%)	17.30	19.41 (12.20%)	33.00	37.33 (13.13%)	29.78	35.02 (17.58%)
T_5 (Thiourea 1.25%)	81.90	90.72 (10.65%)	17.09	19.85 (16.13%)	16.83	19.55 (15.16%)	33.67	38.33 (13.86%)	26.00	30.77 (18.36%)
T_6 (Thiourea 1.50%)	89.10	99.87 (12.08%)	17.17	19.97 (16.33%)	16.76	19.70 (17.52%)	33.66	39.50 (17.35%)	22.43	27.06 (20.67%)

T_7 (Thiourea 1.75%)	89.77	102.18 (13.83%)	16.11	19.40 (20.40%)	15.75	18.93 (20.21%)	33.00	39.66 (20.18%)	30.74	38.56 (25.46%)
T_8 (Thiourea 2.0%)	88.90	104.76 (17.84%)	18.25	22.05 (21.82%)	17.76	21.55 (21.34%)	32.66	41.33 (26.55%)	29.61	39.35 (32.88%)
SEm±	-	1.48	-	0.33	-	0.61	-	0.85	-	0.47
CD at 5%	NS	3.45	NS	1.00	NS	1.48	NS	1.80	NS	1.40

*Percent values in parentheses

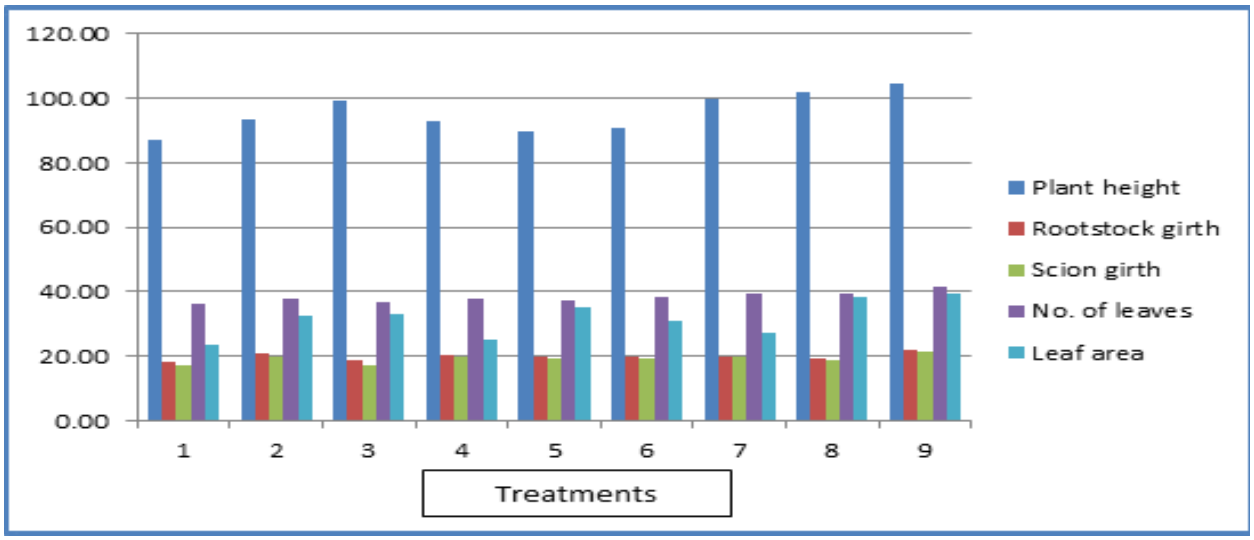

Fig.1. Effect of thiourea on growth parameters of jackfruit cv. Chandra

Conclusion

The study concluded that foliar application of thiourea significantly enhanced the growth parameters of jackfruit plants, with the 2.0% concentration (T_8) showing the best results. The application of thiourea at 2.0% resulted in the highest increases in plant height, rootstock girth, scion girth, number of leaves, and leaf area, significantly outperforming other concentrations and the control.

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Conflict of Interest

The authors have no conflict of interest.

Data Sharing

All relevant data are within the manuscript.

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