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NOVEL CHALCONE DERIVATIVES AS GROWTH PROMOTING AGENTS IN SOME CROP PLANTS

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ABSTRACT
According to a literature review, the growth-promoting hormones auxines, gibberlines, cytokinins, and indole acetic acid are very crucial. The impact of heterocyclic compounds and chalcone derivatives on seed germination, or the lengthening of roots and shoots, and subsequently crop yields, was demonstrated by a number of researchers. We therefore made the decision to investigate a few novel chalcone derivatives on crop plants viz. *Trigonella foenum-graecum (Fenugreek), Vigna aconitifolia (Mataki), Vigna unguiculata (Cowpea), Cicer arietinum (Chick pea)* with special reference to their growth promoting impact.

KEYWORDS: *Chalcone derivatives; Cicer arietinum (Chick pea); Shoot elongation; Seed germination; Trigonella foenum-graecum (Fenugreek); Vigna aconitifolia (Mataki), Vigna unguiculata (Cowpea).*

INTRODUCTION
Most commonly, pharmaceuticals, agrochemicals, and medicinal goods use heterocycles. Heterocycles have demonstrated significant biological effects, including antibacterial, antifungal, anti-inflammatory, antiviral, anticancer, anticonvulsant, anthelmintic, antihistamine, and antidepressant properties. Chalcone is a member of the flavonoid family, which is one of the main categories of naturally occurring heterocyclic compounds. It is also a significant precursor to many heterocyclic nuclei. Literature survey demonstrated various biological activity.[1,2,3,4] of chalcone derivatives[5,6,7,8,9,10,11,12] such as anticancer agent[13,14] antimicrobial activity[15,16,17] antioxidant activity[18,19] antiviral activity[20] pharmacological activity[21,22] anti-diabetic activity[23] etc.

Micronutrients that are beneficial for crop yield and vegetative development have been shown in several experiments to have growth-promoting effects.[24,25] Most widely available substances that promote plant growth are heterocycles. The impact of heterocyclic compounds and chalcone derivatives on seed germination, or the lengthening of roots and shoots, and subsequently crop yields, was demonstrated by a number of researchers.

A crop is what is produced when many plants of the same kind are grown in one location. The majority of agricultural products are grown for human consumption or as animal feed. The amount of seeds or grains that are generated from a specific land plot is known as the crop yield. Understanding food security, or the capacity to produce enough food to satisfy human needs in the near future, requires being able to estimate crop yield.

Trigonella foenum-graecum[26,27] also known as fenugreek, is one of the most accessible distinguished flavour crop plants used in human diets. One of the earliest medicinal plants, fenugreek has an outstanding medicinal and nutritional profile. A significant quantity of fiber, phospholipids, glycolipids, oleic, linolenic, and linoleic acids, choline, vitamins A, B1, B2, C, nicotinic acid, niacin, and numerous other functional substances are found in fenugreek seeds. It is one of the agricultural plants that has nutritive, practical, therapeutic, and nutraceutical properties.

The seeds and sprouts of *Vigna aconitifolia* (Matki bean)[30] with many biological activities,[31] contain abundant nutrients and is a one of the common food.

Vigna unguiculata (Cow pea)[32,33] is a crucial pulse crop with significant nutritional and nutraceutical benefits for global food security and public health. It is typically grown for grain and leaves in less developed areas, with the occasional planting for green pods. It is crucial for the human diet as a supply of macro- and micronutrients.

Cicer arietinum (Chick pea)[34] is a pulse that some areas prefer to food legumes because of its many benefits. Chickpeas are regarded as special due to their high protein composition, which makes up nearly 40% of their

weight. Additionally, the grain chickpea legume product may have health advantages, such as lowering risks for cancer, diabetes, and cardiovascular disease.

EXPERIMENITAL

Material and Methods: In our previous work, a series of novel substituted chalcones[35] (listed in Table 1) were prepared by treating different aromatic aldehydes with different substituted acetophenones in presence of ethyl alcohol and aqueous potassium hydroxide (KOH) solution. These synthesized compounds were characterized by IR and ^{1}H NMR spectra and then assayed for their antibacterial and antifungal activities.

These synthesized chalcones (listed in Table 1) were assayed for their growth promoting impact on test crop plants viz. *Trigonella foenum-graecum (Fenugreek), Vigna aconitifolia (Mataki), Vigna unguiculata (Cowpea), Cicer arietinum (Chick pea).*

Table 1: List of the synthesized chalcones.

Sr. No.	Synthesised Chalcones
1.	3-(2,3-Dichlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one
2.	3-(4-Fluorophenyl)-1-phenylprop-2-en-1-one
3.	1-(2,4-Dihydroxyphenyl)-3-(3-nitrophenyl)prop-2-en-1-one
4.	1-(4-Methylphenyl)-3-(3-nitrophenyl)prop-2-en-1-one
5.	3-(4-Methoxyphenyl)-1-phenylprop-2-en-1-one
6.	1-(4-Bromophenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one
7.	3-(4-Methoxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one
8.	1-(4-Bromophenyl)-3-phenylprop-2-en-1-one
9.	1-(3-Aminophenyl)-3-(4-chlorophenyl)prop-2-en-1-one
10.	3-(4-Hydroxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one
11.	3-(2,3-Dichlorophenyl)-1-(2,4-dihydroxyphenyl)prop-2-en-1-one
12.	3-(4-Chlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one

General procedure- In this respect, the study was split into the two sections below, Seed Treatment and Field Experiment. The plants were divided into two groups as Controlled and Treated group plants. The seeds from the treated group were separately steeped in the suspensions of the titled compounds for 10 hours while the seeds from the controlled group were soaked in water for 10 hours. The solutions used in these tests had a concentration of 1 mg/ml. The seeds were then arranged in various sets that were created especially for the research and labeled, and placed in the coco peat mixed soil beds. They were watered periodically.

The observations were recorded as regard to increase in shoot heights. Average length of plumules was observed after every 24 h. upto next10 days. The comparisons were made between controlled and treated group plants with reference to their elongation of roots and increase in shoot heights. The observed data obtained as on 6th, 8th and 10th day was subjected to analysis of percentage of germination with special reference to growth parameters such as shoot height and root elongation. The observed readings were recorded in Table 2 and 3.

Control Vs Test Compound 10 *T. foenum-graecum (Fenugreek)*


Control Vs Test Compound 12 *V. aconitifolia (Mataki)*


Control Vs Test Compound 8 *C. arietinum* (Chick pea)


Control Vs Test Compound 2 *V. unguiculata* (Cowpea)

Fig. i-iv: Pictorial representation of test compounds on shoot height.

Table 2: Effect of test compounds on seed germination, length of plumule of Fenugreek, Mataki, Cow pea, Chick pea on 6th Day.

Compound	*Trigonella foenum-graecum* (Fenugreek)	*Vigna aconitifolia* (Mataki)	*Vigna Unguiculata* (Cow pea)	*Cicer arietinum* (Chick pea)
	Avg. length of plumule (cm)	Avg. length of plumule (cm)	Avg. length of plumule (cm)	Avg. length of plumule (cm)
Control	1.25	1.65	1.85	1.70
1.	2.60	3.10	6.15	4.90
2.	3.10	3.25	8.10	5.20
3.	3.55	3.75	5.30	4.30
4.	2.90	3.55	5.15	6.00

5.	3.45	3.80	5.25	5.75
6.	3.00	3.70	5.00	5.15
7.	2.65	3.20	5.30	5.30
8.	2.85	3.15	8.00	5.60
9.	2.90	3.60	5.60	6.00
10.	3.50	3.55	7.75	6.10
11.	3.00	3.10	7.70	5.75
12.	3.15	3.25	6.50	5.25

Table 3: Effect of test compounds on seed germination.

Sr. No	Compound	*Trigonella foenum-graecum* (Fenugreek)	*Vigna aconitifolia* (Mataki)	*Vigna unguiculata* (Cow pea)	*Cicer arietinum* (Chick pea)
1.	Control	45	50	50	40
2.	1	80	80	90	85
3.	2	86	85	95	83
4.	3	84	80	90	86
5.	4	87	90	84	89
6.	5	88	85	87	88
7.	6	90	90	92	87
8.	7	91	100	95	92
9.	8	96	95	97	91
10.	9	97	95	96	90
11.	10	93	94	92	85
12.	11	90	93	87	88
13.	12	96	92	89	85

RESULTS AND DISCUSSION

In the present study, comparison of morphological characters of controlled and treated group plants; it was interesting to note that the treated group plants exhibit significant improvement in shoot heights and elongation of roots as compared to control group plants. Analysis of seed germination study of test compounds clearly showed that there was good percentage of germination, enhancement in growth of shoot heights in all treated plants. When all the treated plants were compared among themselves it was distinctly seen that morphological change in *V. unguiculata* (Cow pea) was dominant than other test plants. More detailed results showed that compounds 2,8,10,12 were found very effective in the enhancement of morphological characters.

The percentage of germination of control group plants and treated group plants showed a significant difference when seed germination data were analysed. Compounds 2, 7, 8, 9, 10, 11, and 12 generally had positive impacts on the percentage of germination. Particularly for all the groups of treated plants, compound 7 demonstrated excellent outcomes, especially in test plants *V. aconitifolia* (mataki) and *V.unguiculata* (cow pea), it demonstrated outstanding results. Test compounds 8 and 9 also demonstrated outstanding results for shoot elongation in case of *V.unguiculata* (cow pea).

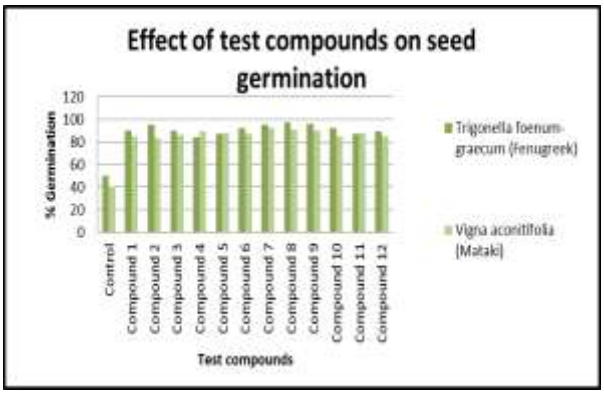

Fig. i) Graphical representation of percentage of germination.

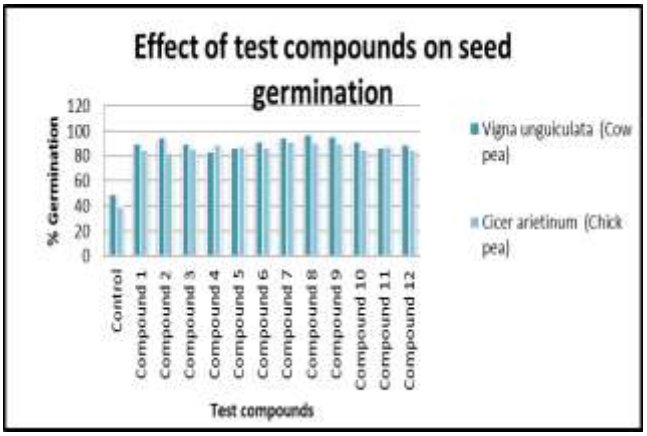

Fig. ii) Graphical representation of percentage of germination.

CONCLUSION

It was inferred from the discussion above that the effects of test compounds were found to be significant in all the treated group plants when compared to the control group plants. However, more in-depth research in the context of agricultural sciences, particularly for their ability to control plant disease, would undoubtedly prove to be a useful instrument for service to society.

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