Impact of *Costus igneus* on Seed Germination and Seedling growth of *Cajanus Cajan (L).*

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Abstract

Impact of aqueous extracts of *Costus igneus* on *Cajanus Cajan (L.*) growth was studied. The suppressive effects of extracts from the sources were concentration dependant being maximum at 100% concentration. Seed germination and seedling growth of *Cajanus cajan* (L.) was greatly affected by water extract of *Costus igneus*. Aqueous extracts of *Costus igneus* at all concentrations (25%, 50%, 75%, 100%) significantly inhibited seed germination and seedling growth of *Cajanus Cajan (L.*) when compared with distilled water control. However, aqueous extracts of *Costus igneus*, the low concentration was found to have a stimulatory effect and more enhances the seed germination and seedling growth.

Key word: Aqueous extract, *Costus igneus, Cajanus cajan(L.)*, Red gram.

Introduction

A member of the Costaceae family, Costus igneus better known by their popular name, "Spiral flag," is a recently introduced plant from South and Central America to India. With spiral-arranged leaves and eye-catching blossoms, this perennial grows erect and spreading to a height of around two feet. It often grows as an attractive plant in southern India, and its leaves are supplemented with food to cure diabetes mellitus. Many studies have been conducted recently to assess this plant's potential as an anti-diabetic agent.

Native to South and Central America, Costus igneus is also known by several names, including flaming costus, step ladder, spiral flag, and insulin plant. Known as the "insulin plant," it was brought to India from America as a natural remedy for diabetes relatively recently[B.Jose et.,al 2010]. In South India, it is commonly planted as a decorative plant in gardens and is also allowed to roam freely in many areas[M.Benny 2004]. People with diabetes are known to consume one leaf per day to maintain low blood glucose levels. It is utilized as a diabetes treatment in India[V.D.Devi et.,al 2008]. Among the plants that the Kolli tribal people are known to utilize successfully to cure diabetes are the leaves of C. igneus[S.Elavarasi et.,al 2012]. The portion in arial part this plant is used as an infusion to treat renal diseases in traditional Mexican medicine[M.E. Melendez et.,al 2006]. The plant belongs to the Costaceae family. Nakai was the first to elevate Costaceae to the family level, distinguishing it by its spirally arranged leaves and the absence of fragrant essential oils in its rhizomes. Before its elevation to family status, Engler and Prantl identified Costaceae as a subfamily of Zingiberaceae. This unique classification is supported by several anatomical and morphological traits, such as a well-developed aerial shoot with distinct, stiff, and often branching stems. The largest genus in the family, Costus, includes over 150 species, most of which are found in tropical regions[M.benny 2004, S.Elavasari et.,al 2010]. The current review addresses contemporary studies

conducted on Costus igneus Nak in the fields of phytochemistry, pharmacology, biological activity, and safety.

Biochemical interactions between plants both inhibitory and stimulatory, through the release of secondary substances into the environment by decomposition of plant residues, root exudates or leaching by rain are termed as "Allelopathy" (Rice, 1984). The inhibition of one plant by another through the release of allelochemicals is well known (Jadhav & Gaynar, 1995). Allelopathy is a phenomenon of chemical regulating and controlling in natural ecological systems and is a mechanism of organisms accommodating environment (Peng et al., 2004). Recent years, a lot of research has been conducted in the allelopathy of plants worldwide (Mo et al., 2005). The objective of this study was planned to evaluate the allelopathic effects of aqueous extracts of *Costus igneus* on *Cajanus cajan* seedling growth and seed germination.

Materials and Methods

Identified and procured the *Costus igneus* from medicinal plant nursery from Kadiyapulanka, East Godavari district and propagated in T.U Chacko memorial Botanical garden Research plot of college campus.

Procurement of seeds of *Cajanus cajan* (LAM Red gram -LRG-52) from Guntur farms

Three sets of ten seeds each and 25%, 50%, 75% and 100% concentrations of Whole plant aqueous extract of *Costus igneus* were used for this study along with control (tap water). Six experiments have been conducted for this study during the month of November and December 2024 with a week days interval and standard deviation is used for this preliminary statistical analysis.

Standard glassware were used from the laboratory, Whatmann no.1 filter paper was used for the study and BOD incubator for germination studies, Ampicillin antibiotic used to avoid microbial contamination.

Growth & Propagation

Spiral flags thrive in either direct sunlight or partial shade. They are typically grown near water sources and require rich soil with plenty of moisture. Propagation methods include dividing the clumps, using cuttings, or separating the offsets that grow beneath the flower heads. Nematodes and mites can pose problems, especially in light, sandy soil. However, the plant is not significantly affected by serious diseases[E.F Gilman et.,al 2012].

Preparation of Aqueous extract of Costus igneus and application on seeds:

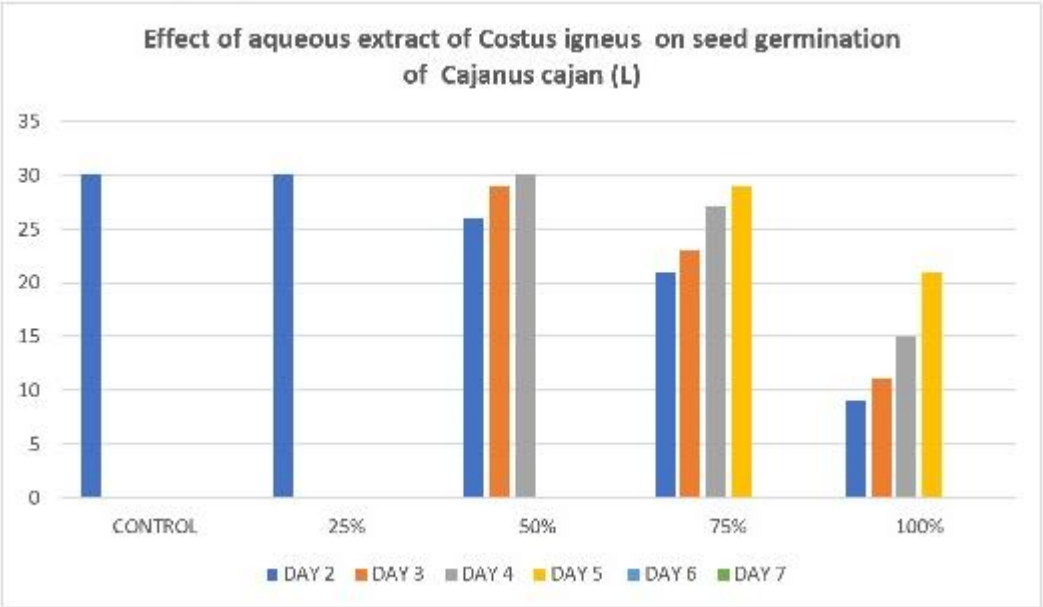
Aqueous extracts of the whole plant mixture were prepared by digesting 10gm of air dried material of *Costus igneus* in 100ml distilled water for 24 h at $25^0C \pm 5^0C$. It was filtered through Whatmann filter paper no.1 of the volume of filtrate made to 100ml (Dhawan and Narwal 1994). Different dilution of the extract i.e. 25%, 50%, 75% and 100% were prepared from this stock solution. The experiment was laid out in complete randomized block design with three replications. For control seeds were soaked in distilled water only. The seeds of Red gram were sterilized by dipping in the solution of 0.1% $HgCl_2$ for 1 min followed by 3-4 washing under running tap water to remove residues of $HgCl_2$ and dried in folds of ordinary filter papers in each Petri dish containing Whatmann no. 1 filter paper was kept at the bottom and there after seeds arranged

on the top of the filter paper. The Petri dishes were covered with glass covering. They were incubated for 5 days. The whole set of experiment was kept undisturbed at room temperature of $25^0C \pm 5^0C$.

In seed germination ten seeds of each petridish covered with Whatmann NO.1 filtre paper inside and six sets repeated thrice of Cajanus cajan seeds treated with Costus igneus plant includes Rhizome, Stem and leaf in 25%, 50%,75% and 100% of aqueous extract(A.A). The results were observed from second Day and final results were noted after seven days along with control-treated with tap water.

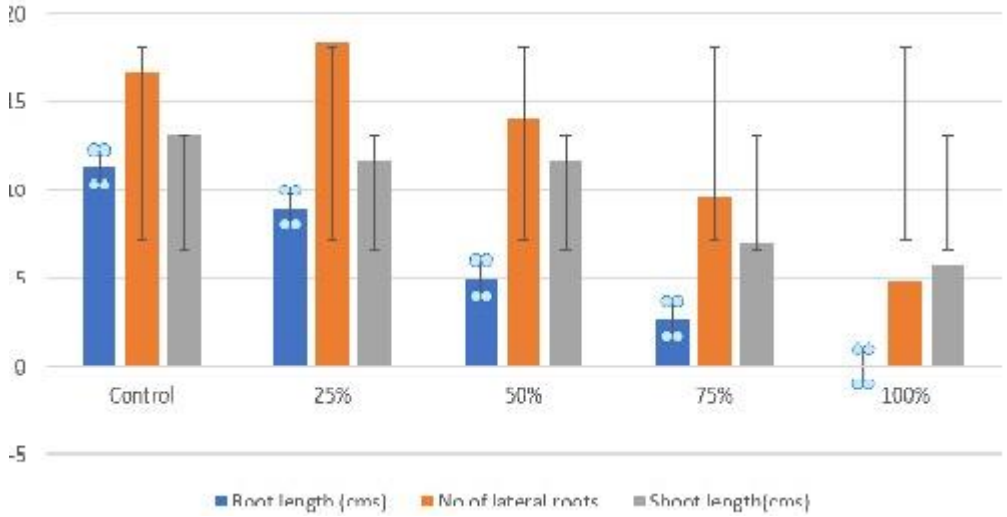
Results

The results were mentioned for seed germination in Table-1. The higher concentration is inhibited the seed germination only 82% of seeds were germinated, remaining were not responded. Control plants were responded gradually. It is interesting that the lower concentration i.e., 25 % were more enhanced and the germination promotes in second day itself.



Impact of aqueous extract of Costus igneus on seed germination of Cajanus cajan (L)

The results were mentioned for root length, number of lateral roots, shoot length in Table-2. The same 25%, 50%,75% and 100% of whole plant including Rhizome, Stem and leaf aqueous extract was treated in four different concentration along with control treatrd with tap water.The higher concentration of A.A is more inhibited the root length, number of lateral roots and shoot length also. It is interestingly note that the lower concentration i.e., 25% of A.A is more enhanced especially in no.of lateral roots.



Impact of aqueous extract of Costus igneus on seedling growth of Cajanus cajan(L)

Discussion

The literature on the leaves, seeds and roots of C. cajan has demonstrated notable anti-inflammatory, anti-bacterial and abirritative properties [Pal et.,al 2011; Zhang et.,al 2010]. [Pal et al.2010] have reported the biological activities and medicinal properties of C. cajan. However, there is no nutritional and functional comparison between the leaves, seeds, and roots of C. cajan in the same reaction systems at the same time.

Legumes, a major food of the human diet, may contribute to some of the health benefits associated with this eating pattern. Their health benefits include a low saturated fat content, high content of essential nutrients, richness in important micronutrients (including potassium, magnesium, folate, iron, and zinc) [Virginia messina 2014] and bioactive compounds. They are responsible for different antioxidant, anticarcinogenic, anti-inflammatory, antidiabetic activities, etc. [Alvarad et.,al 2019]

Plants always have been an exemplary source of drugs because they are rich in bioactive compounds and phytochemicals. Plant polyphenols have gained much attention and popularity because of their multiple functions and minimal side/adverse effects [Bahadoran et.,al 2013]. The antidiabetic effect is one of the most intensely studied biological roles of polyphenols, such as flavonoids, terpenoids, saponins, carotenoids, alkaloids, and glycosides [Kooti et.,al 2015; Afrishman et.,al 2015].

Conclusion

The review provides evidence in favor of the leaves potential therapeutic use in diabetes. Clinical trials must, however, assess and validate these findings further. Its leaves are presently being investigated on diabetic patients for its anti-diabetic properties. Research reveals how it functions in a number of disorders, which creates new avenues for clinical study. It also opens up new possibilities for researching the substances causing these therapeutic effects and the manner in which they work.

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