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ALLELOPATHIC EFFECT OF *CASCABELA THEVETIA (L)* ON GROWTH AND METABOLISM OF *ALTERNANTHERA SESSILIS(L) R.Br.*

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ABSTRACT: The present research work deals with toxic effect of Cascabela *thevetia L* its powdered leaves and stem residues on growth and metabolism on weed *Alternathera sessilis L*. The production leaves and branches of weed hampered and greatly influenced after 15 and 30th day of sowing. Concurrently its biochemical constituents, such as total chlorophylls, polyphenols, proteins and carbohydrate contents get reduced in the Leaves of *Alternanthera sessilis L* after the application of leaf and stem residue 15th, 30th and 45th days after sowing. These phytochemicals were greatly diminished as compared to control. Therefore, these toxic residues or allelochemicals may inhibit growth and metabolism of *Alternathera sessilis L*, hence, allelopathic potential allows introduction of alternative techniques for weed management.

Key words: - *Cascabela thevetia L*, *Alternathera sessilis L*, allelochemicals, chlorophylls, polyphenols, proteins and Carbohydrates.

I] INTRODUCTION

Alternathera sessilis L annual small, prostate herbaceous tropical and subtropical weed, native South America and commonly called khaki weed, belongs to Family: Amaranthaceae. This weed naturally growing in arable and non-arable land in India, and found in all crop field during kharif season. The weed compete for water, nutrients, sunlight and space, along with harbour pathogen and insects, which attack on crop plants, showing a considerable loss in the productivity, therefore weeds considered as a serious plant pest (Zimdahl. 2013). as it is a fast growing weed. At present use of chemicals such as herbicide promotes hazards in agro-ecosystem as well as live-stock. Therefore an alternative management of weeds is our aim to study which helps to improve agricultural produce, so that plant based herbicides, which is Eco-friendly is urgently needed in our agricultural system.

Cascabela thevetia L used as one of plant material for studying herbal herbicide. A small shrubby poisonous plant native to Mexico, Central America, commonly known as Yellow Oleander and Kaner or Kaneir in Hindi belongs to family: Apocynaceae. It is also known as fortunate nut, grows aggressively and forming thickets in low-lying areas, sometimes it is cultivated in gardens as well as a avenue shrub, because of beautiful yellow coloured flowers. The whole plant parts are considered to be toxic to vertebrate animals, as it contains cardiac glycosides, including man (Shannon. D. and Boor 1996). A systemic screening of phytochemical reveals plant possess, alkaloids, steriods, saponins, coumarins, flavonoids, cardiac glycosides, tannins, steroids, anthraquinone glycoside,

oils and fats. (Rahman et al., 2014). The flower of *Cascabela thevetia L* showed the presence of quercetin, kaempferol and quercetin-Y-O-galactoside. Whereas phytochemicals such as iridoids, theveside 10-O-β-D-Glucopyranosyl theviridoside and 3-O-β-D-Glucopyranosyl theviridoside (Kumar et al., 2017). Meanwhile leaf contains chemicals such an iridoid glucosides, triterpenes, neolupenyl acetate, oleanolic acid, ursolic acid and sitosterol etc etc. Because of presence of huge phytochemicals, plant was selected.

II] MATERIAL AND METHODS

Leaves and stem of *Cascabela thevetia L* were collected from Near NCC Bhavan infront of Shivaji University, Kolhapur for experimental study during the month of Nov- Dec 2022. The collected plant samples were brought to the laboratory, washed with tap water followed by distilled water. Later both leaves and stems were cut into small pieces, these small piece were first sundried for 2 consecutive days, followed by kept in electric oven at 60°C for two days. The oven dried samples were finally powdered in a domestic grinder into fine powder separately. The pot studies were carried out in the garden of Department of Agrochemicals and Pest Management, Shivaji University, Kolhapur.

10 kg capacity black coloured polyethylene bags were used for growth parameters, in that 5 kg of Loam soil mixed with leaf and stem residues of *Cascabela thevetia L*. The sample of leaf and stem with 20g, 40g, 60g and 100g (2%, 4%, 6% and 10%) were boiled in 500 ml of water, separately, after cooling, mixed with 5kg of fine Loam soil filled separately in polyethylene bags. In each polyethylene bag, five viable seeds of *Alternathera sessilis L* were sown in equal distance. One polyethylene bag considered as control i.e. without any residue. Uniform water was done i.e.100 ml water per day per polyethylene bag, continuously up to 30 days (Days After Sowing). After 15th day and a month later growth parameter, such as height, and branches of the weed measured. Simultaneously biochemical analysis was carried out.

The treated residue of *Cascabela thevetia L* on *Alternathera sessilis_L* were carried out in randomized block design of four replicates. The production of leaves, height and branches of *Alternathera sessilis L* i.e. growth parameter was calculated after 15th and 30th day of sowing. The percentage of reduction were calculated in all residues. The biochemical or phytochemical constituents were measured after 15th ,30th and 45th day of sowing. The total chlorophylls content was measured by method of Arnon (1949), the polyphenol content was estimated by Folin and Denis (1915) method. Thee protein content was calculated by method of Lowry et al. (1951) and total carbohydrate content was determined by Anthrone method prescribed by Hodage and Hofreiter (1962) and Thayumanavan and Sadasivan (1984).

III] RESULT AND DISCUSSION

The impact of allelochemicals of *Cascabela thevetia L* on growth and metabolism of weed *Alternathera sessilis L* were depicted in Table 1, 2 and 3. The growth parameter i.e. production of leaves greately denounced in all concentration of leaf residue (Table 1). A 44% decrease of leaf production was recorded at 10 % concentration, after 15 days of sowing, similarly furthermore production reduced to 33 % after 30 days of sowing. In all production of leaves get hampered, this indicates impact of allelochemicals, penetrate the soil and modified the essential growth related biochemicals. A collateral report was documented by Nagaraja and Pudale (2013) due to residues of *Asclepias curasavica L* and Hodage et al. (2023) on Ficus *elastica L*. Allelochemical has enormous potential to act as an herbicide due to its high activity against various weeds species (Nimbal, et al. 1996 and Bhowmik 2003). Even the stem residue of *Cascabela thevetia L* reflects (Table 2) 55 % of decrease in production of leaves after 15 days of sowing and greatly reduction of 50 % at 10 % concentration after 30 days of Sowing (Table 2), therefore, the phytotoxic ability of *Cascabela thevetia L* noticed (Chung et al. 2005).

The height of *Alternathera sessilis_L* much hindered, (Table 1 and 2), due to residue of leaf and stem of *Cascabela thevetia L* 61 % reduction was recorded at 10 % leaf residue after 15 days of sowing and 54 % reduction after 30 days of sowing. But stem residue also equally responsible for retardation of height (growth). A maximum retardation was observed at 10 % concentration after 30 days of sowing (table-2). The biology of donor and target plants with their exact allelochemicals responsible for the interaction, result in retardation (Macias et al. 2007).

The residues of leaf and stem of *Cascabela thevetia L* alters the biochemical constituent of *Alternathera sessilis L* (Table 3). The total Chlorophyll content get reduced 279.47 mg of chlorophyll get reduced to 205.89 mg per gram of fresh tissue, in stem at 10 % concentration, to a extent of 73 % reduction, similarly as 91 percent in leaves at 6 percent concentration, the lowered content of chlorophyll may be due to allelochemicals interactive a, concurrent report was recorded by Nagaraja and Deshmukh (2009) in residues of *Andrographis paniculata*. The total polyphenol content gets diminished as result of action of leaf and stem residue of *Cascabela thevetia L* on *Alternathera sessilis L*. 4.21mg of polyphenol get at reduced to 3.83 mg in leaf tissues after 15 days of sowing at 10 percent concentration, similarly in stem residue it decreased to 3.0 mg per gram of fresh tissue, to the extent of 90 % and 71 % respectively. A parallel report was documented by Nagaraja and Pudale (2013) in *Asclepias curasavica* and Nitin et al. (2023).

The protein content of leaf and stem of *Alternathera sessilis L*, get reduced, due to effect of residue of *Cascabela thevetia L* (table-3). 138.90 mg of protein per gram of fresh tissue reduced to 61.08 mg of after 30th day of sowig at 10 % concentration, reduced to extent of 43 percent in leaves and 47 percent in stem. The allelochemicals may responsible to help in order consume protein as a respiratory substrate. A similar elucidation was reported by Nagaraja and Deshmukh (2009) in *Andrographis paniculata*. The carbohydrate content significantly denounced in the leaves and stem of *Alternathera sessilis L* due to impact of residue of *Cascabela thevetia L*(Table-3) 26.7 mg of total carbohydrate get reduced to 7.51 mg per gram of fresh tissue at 10 percent concentration after 45th day of sowing, in leaves and 20.51 mg per gram of fresh tissue in stem (*Alternathera sessilis L*). The leaf shows reduction of 28 percent, while stem 76 percent reduction. The lowered amount of Carbohydrate may be due to allelochemicals interaction, result in metabolic shift, or synthesis of antimicrobial secondary metabolites generated in response to signal molecules (Okada, et al. 2009). A similar condition was recorded by Nagaraja and Pudale (2013) and Nitin et al. (2023).

Therefore, residue of *Cascabela thevetia L* strongly affect, the growth and metabolism of *Alternathera sessilis L*, their phytotoxic abilities or allelochemicals, may be considered for possible use of weed management as eco-friendly bio herbicide.

IV] ACKNOWLEDGEMENT

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V] TABLES

Table -1 Allelopathic effect of *Cascabela thevetia L* on a growth and development of *Alternathera sessilis L* after 15 days of sowing.

		Leaves Residue				Stem residue			
Sr. No.	Treatment by residue	Production of leaves per plant after 15 days	Percentage (%) of reduction	Plant height after 15 days (cm)	Percentage (%) of reduction	Production of leaves per plant after 15 days	Percentage (%) of reduction	Plant height after 15 days (cm)	Percentage (%) of reduction
1.	Control	09	-	2.6	-	09	-	2.6	-
2.	2 %	05	55.55	2.3	88.46	05	55.55	2.1	80.76
3.	4 %	05	55.55	2.3	88.46	06	66.66	2.2	75.86
4.	6 %	05	55.55	1.7	65.38	05	55.55	1.9	73.07
5.	10 %	04	44.44	1.6	61.53	05	55.55	1.6	61.53

Table -2 Allelopathic effect of *Cascabela thevetia L.* on a growth and development of *Alternathera sessilis L* after 30 days of sowing.

		Leaves residue				Stem residue			
Sr. No.	Treatment by residue	Production of leaves per plant after 30 days	Percentage (%) of reduction	Plant height after 30 days (cm)	Percentage (%) of reduction	Production of leaves per plant after 30 days	Percentage (%) of reduction	Plant height after 30 days (cm)	Percentage (%) of reduction
1.	Control	12	-	5.1	-	12	-	5.1	-
2.	2 %	07	58.33	4.0	78.43	08	66.33	4.1	80.39
3.	4 %	06	50	3.5	68.62	07	58.33	3.7	72.54
4.	6 %	04	33.33	3.6	70.58	06	50	3.9	76.41
5.	10 %	04	33.33	2.8	54.90	06	50	2.5	49.01

Table- 3 Biochemical constituents

Effect of residues of *Cascabela thevetia L* leaves and stem on *Alternathera sessilis L.*

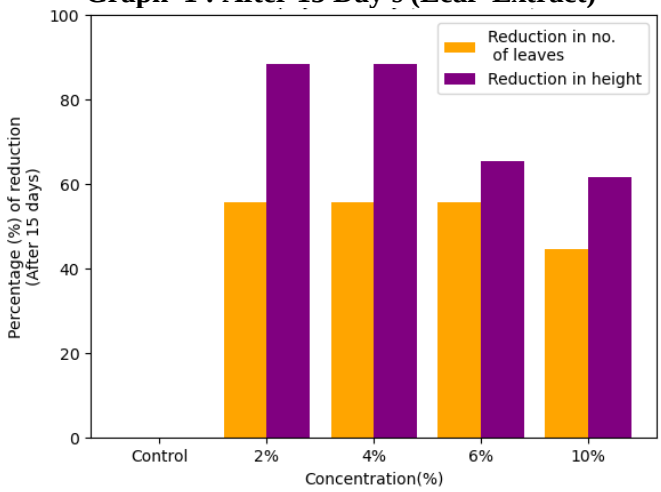
Sr.No.	Constituents	Control	Leaves residue				Stem residue			
			2 %	4 %	6 %	10 %	2 %	4 %	6 %	10 %
1.	Chlorophyll a*	31.62	40.8	34.18	41.74	29.77	37.81	39.59	35.93	27.67
2.	Chlorophyll b*	246.4	118.53	226.21	213.56	200.97	195.29	231.88	211.32	178.22
3.	Total* Chlorophyll (a+b) (After 15 days)	279.47	159.33	260.39	255.33	230.74	233.10	271.47	247.25	205.89
4.	Polyphenol* (After 15 days)	4.210	5.26	4.11	4.08	3.83	4.18	5.02	3.15	3.00
5.	Protein* (After 30 days)	138.90	83.20	96.20	74.20	61.08	98.90	84.32	81.68	65.40
6.	Carbohydrade* (After 45 days)	26.7	16.63	11.87	9.42	7.51	23.02	25.48	21.87	20.51

* Expressed as mg^{-1} g^{-1} of fresh tissue

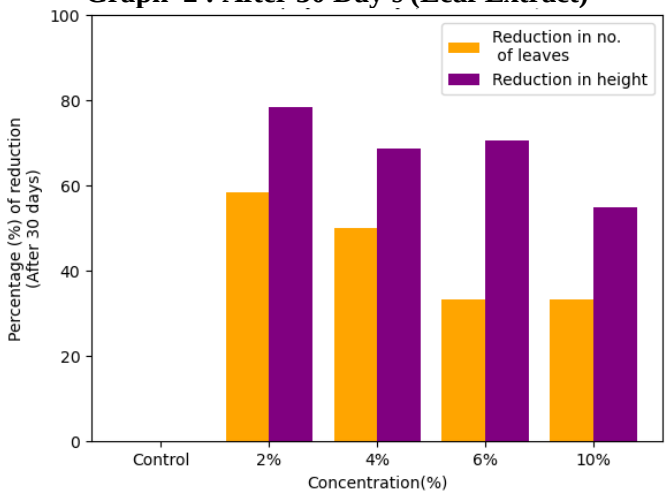
VI]GRAPH

❖ Allelopathic effect of *Cascabela thevetia L* leaf residue on a growth and development of *Alternathera sessilis L* after 15th and 30th days of sowing

Graph 1 : After 15 Day's (Leaf Extract)

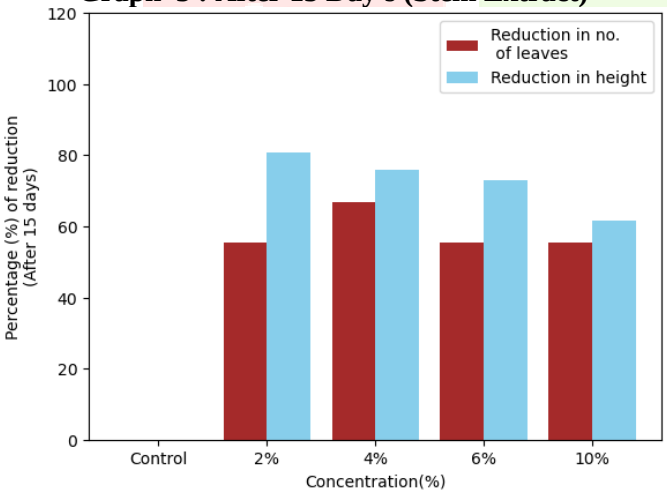


Graph 2 : After 30 Day's (Leaf Extract)

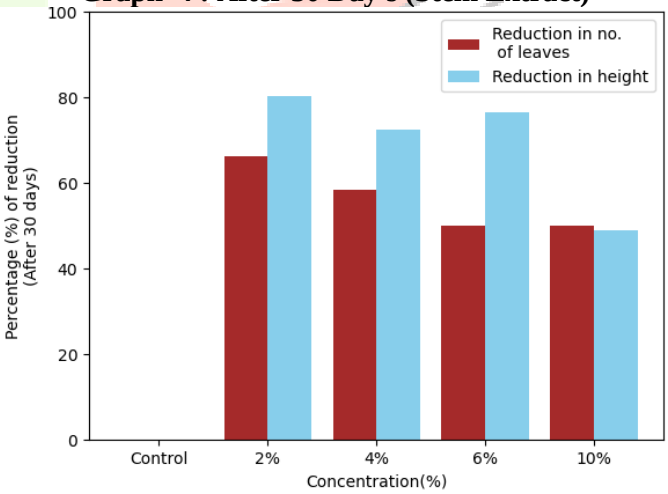


❖ Allelopathic effect of *Cascabela thevetia L* Stem residue on a growth and development of *Alternathera sessilis L* after 15th and 30th days of sowing

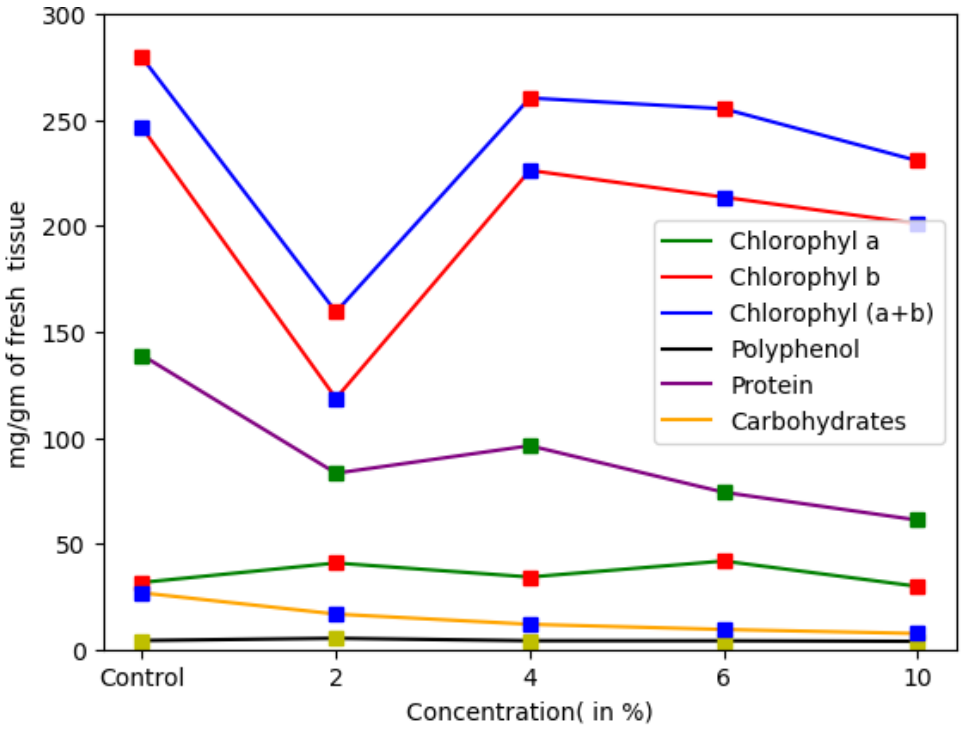
Graph 3 : After 15 Day's (Stem Extract)



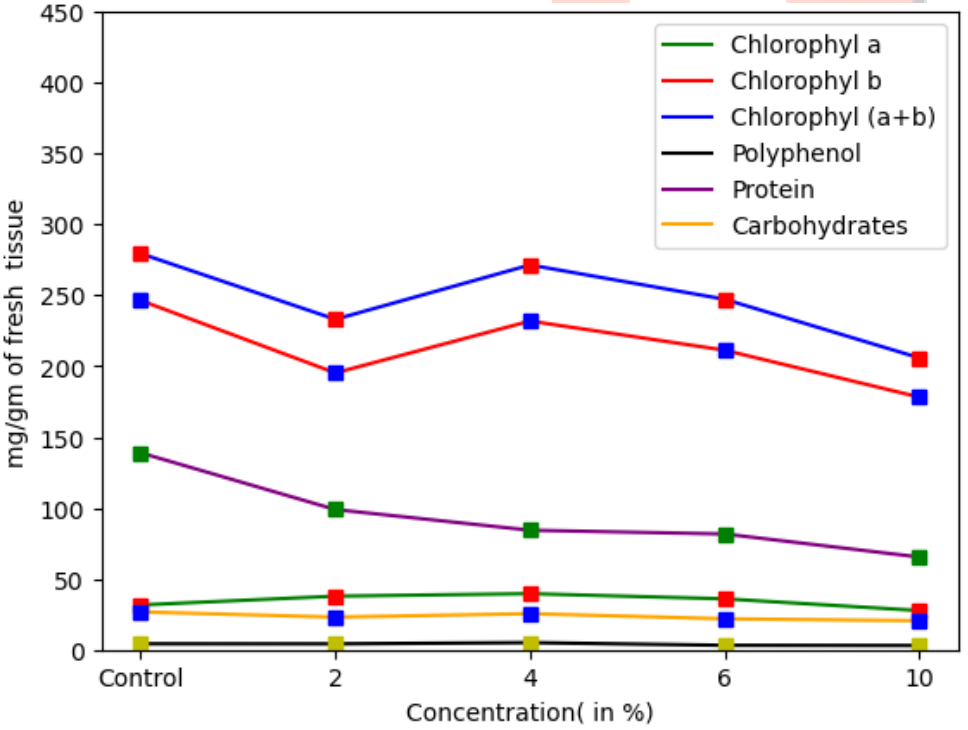
Graph 4 : After 30 Day's (Stem Extract)



❖ **Graph 5 :Biochemical constituents of *Alternanthera sessilis L.* under phytotoxicity (Leaf Extract)**



❖ **Graph 6 : Biochemical constituents of *Alternanthera sessilis L.* under phytotoxicity (Stem extract)**



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