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PHYTOTOXIC EFFECT OF *FICUS ELASTICA ROXB.* ON METABOLISM OF PARTHENIUM HYSTEROPHORUS L.

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ABSTRACT **:** The present investigation deals with toxic effect of powdered roots, stem and leaves of *Ficus elastica Roxb.* adversely affected the metabolism of *Parthenium hysterophorus L* upto 30 DAS.The aqueous plant extract influenced height and number of leaves after 15 and 30 days in *Parthenium hysterophorus L.* Simultaneously biochemical constituents such as total chlorophyll, polyphenols, carbohydrates and protein contents were greatly declined in roots, stem and leaves of *Parthenium hysterophorus L,* supplied with *Ficus elastica Roxb.* residue after 15Th,30 Th and 45 days of sowing.The polyphenols, protein and carbohydrate content were inadequately decreased as compared to control. Hence residue of *Ficus elastica Roxb.* may be used as potential bioherbicide.

Key words:- *Ficus elastica Roxb., Parthenium hysterophorus L,* chlorophylls, polyphenols, carbohydrates and proteins.

1.INTRODUCTION

Parthenium hysterophorus L a native to the American tropics, commonly called as whitetop weed, santameria weed, etc. In India known as congress grass or Gajar ghas, belongs to family : Astraceae. It is an annual herb, aggressively colonizes in disturbed areas. It is considered as one of the 100 most invensive species in the world. It is reported as a major weed in field crops more than 45 countries, (Bajwa *et al.*,2016; Shabbir *et al.*2019) with estimated loss of millions of dollars. It is also widespread in India, and entered along with foodgrains imported from USA (Vartak, 1968), found in greenland, orchards, fruit trees, aerable land in natural and acidic soils, considered to be a major problem (Gupta and Sharma, 1977), because of its high seed dispersal, fecundity and ability to grow even in adverse environmental condition, creates an adverse impact upon agro-ecosystem, human health and the environment.

It also create allergenic to some people and livestock, allergic skin diseases, asthma in human beings, due to presence of allelopathic effect (Das and Das, 1995).

The allelopathic effect of the weed result into release of phytotoxic substance such as parthenin, chlorogenic acid, P- coumaric acid, hydrobenzoic acids, ferulic acids, ambrsasin and coronopilines etc, which inhibits germination and growth of several crops as well as multipurpose tree (Basak, 1984). Therefore, it is a problematic weed in our agriculture system. No single method alone has been effective in its management, although an integrated management approach has some sort of measurable impact (O' Donnell and Adkins, 2005). The use of herbicide again influence hazards in our agri ecosystem. Therefore, an attempt was made an alternative, eco-friendly approach to manage *Parthenium hysterophorus L* by allelo chemicals utilized and released by *Ficus elastica Roxb.*

Ficus elastica Roxb. Hornew also known as rubber tree, belong to family: Moraceae, native to estern part of south and southeast Asia. A popular ornamental houseplant in temperate climate with shiny leaves, growing to height of 10-15 feet, and cultivated in gardens, even in portico. The latex sap from this rubber tree was used to make water proof cloths, and even to form homemade shoes, oil extracted can be used in soap, paints, varnishes and an insect repellent.

Ficus elastica Roxb. Ex. Hornew possesses antimicrobial activity, as diuretic agent, and antioxidant activity. The plant contains various phytochemicals such as ficuselastic acid, glucopyranosyl abscisate sodium, quercitrin, kaempferin, syringin, corchoionoside, roseoside, ursolic acid, icariside, oleanolic acid, citroside, myricitrin, etc (Phan Van Kiem. et al., 2012). As the plant possess huge amount of phytochemicals hence, an attempt was made to study the effect of phytochemicals (Allelochemicals) on growth and metabolism of *Parthenium hysterophorus L* to recognize its suitability as a botanical herbicide.

2.MATERAL AND METHODS

Freshly harvested roots, stem and leaves of *Ficus elastica* Roxb. Collected from Ambai Defence Colony, Samrat nagar, Kolhapur for experimental study. During Sept – Jan 2022 – 2023. The collected sample were brought to the laboratory and washed with tap water followed by distilled water, cut into small pieces. These sample pieces were first sun dried for 2 consecutive days followed by kept in electric oven at 60°C for 2 days. The dried sample of roots, stem and leaves were finally powdered in domestic grinder separetely. The pot studies were carried out during Sept 2022 to Jan 2023 in the Garden of Department of Agro chemicals and pest management, Shivaji University, Kolhapur.

The fine black coloured plastic/polyethylene bags with 10 kg capacity were filled with 5 kg of fine loam soil. The sample of roots, stem and leaves with 20 g, 40g, 60g and 100g (2%, 4%, 6% and 10%) dried powder was boiled in 500 ml of water in each beaker, after cooling, mixed with 5 kg of fine loam soil, filled in polyethylene bag separately. In each polyethylene bag separately five viable seeds of *Parthenium hysterophorus L* were sown in equal distance. One polyethylene bag considered as control i.e. without any sample. Uniform watering was carried out i.e. 100 ml water per polyethylene bag continuously up to 30 days (Days after sowing). After fifteen day and one month growth parameter and biochemical analysis was carried out.

The treated residues of *Ficus elastica Roxb.* On *Parthenium hysterophorus L,* were carried out in randomized block design of four replicates. The growth parameter such as number of leaves, plant height were measured on 15^{Th} and 30^{Th} day after sowing. The percentage of reduction was observed in all residue. The biochemical constituents were estimated after 10^{Th},15^{Th}, 30^{Th} and 45^{Th} day of sowing. The total chlorophylls content was measured by Arnon in (1949) method, the polyphenol content were determined by the method of Folin and Denis (1915). The protein content were estimated by method of Lowery *et al.*, (1951) and total carbohydrate was determined by anthrone method prescribed by Hodage and Hofreiter (1962) and thayumanavan and Sadasivan (1984).

3.RESULT AND DISCUSSION

The residue parts of *Ficus elastica* Roxb. roots, stem and leaves significantly inhibited the growth parameters like production of number of leaves and plant height on *Parthenium hysterophorus L* (Table- 1. a, b, c) The production of number of leaves was greatly hindered due to activity of residues of root, stem and leaves of *Ficus elastica Roxb.* 83.33 percentage and 85.71 after 15 days and 30 days of sowing, as compared to control (100%). While a production of leaves was greatly reduced at 10 %, constituents of all residues. A parallel results was reported by Nagaraja (2013) due to residue of *Asclepias curasavica* Linn.

Even though growth of weed *Parthenium hysterophorus L* also adversely affected by the residues of root,stem and leaves. Root residues shows 83.78 % reduction after 15 days of sowing and 85.71 % after 30 days of sowing (Table- 1.a, b, c) where as a maximum 97.29 % decline after 15 days and 97.61 % after 30 days suggest hinderance of growth due to of stem residue, significantly reveals phytotoxic effect, even leaf residue greatly affected growth to 85.48 % and 92.85 % as compared to control (100 %).

Hence, presence of phytochemicals or allelo chemicals may have toxic effect on physiology and metabolism process. Therefore, growth inhibition may be due to allelo chemicals released from roots, stem and leaf of *Ficus elastica* Roxb. (Thaper and Singh, 2006).

The biomas (residues) of *Ficus elastica* Roxb. adversely hampered the phytochemicals of *Parthenium hysterophorus L.* The total chlorophylls get greatly minimized in all different concentrations of residues. 273.85 mg of chlorophyll per gram in leaves after15 days of sowing reduced to 138.55 mg, with a reduction of 50.59 % as compared to control, similarly in stem reduced to 270.5 mg with a reduction of 62.51 % after 15 days of sowing. A concurrent finding was reported by Nagaraja and Deshmukh (2009) in residues of *Andrographis paniculata*. The biochemical polyphenol was responsible for resistance has been extensively worked out by Deshpande (1993), get diminished in all residues of root, stem and leaves *Parthenium hysterophorus L* (Table 2).Among stem residue it get shorten to 67.57 %, while in leaves reduced to extract of 26.97 %.

The total carbohydrate content in all residues of *Ficus elastica Roxb.* get curtailed after 45 days of sowing. At 10 % concentration in all residues recorded 20-23 % of reduction of carbohydrates (Table-2), suggested that these allelochemicals may interference with photosynthesis, in relation to water (Colton and Einhelling,1980), and nutrient uptake (Craig and Einhelling,1980). The protein content also get reduced in all residues of root, stem and leaves, (Table 2) after 30 days of sowing, at 10 % concentration of root, stem and leaves residues shows significantly deflated protein content. A similar report was documented by Nagaraja and Pudale (2013) in *Asclepias curasavica* residues. protein content may be consumed as respiratory substrate, when carbohydrate supply was inadequate, may be due to effect of allelochemical. Thus in all residues of *Ficus elastica* Roxb. influence growth and metabolism of *Parthenium hysterophorus L.* Therefore it can be used as eco-friendly herbal herbicide for management of weed in agriculture.

4.ACKNOWLEDGEMENT

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5.TABLES AND GRAPHS

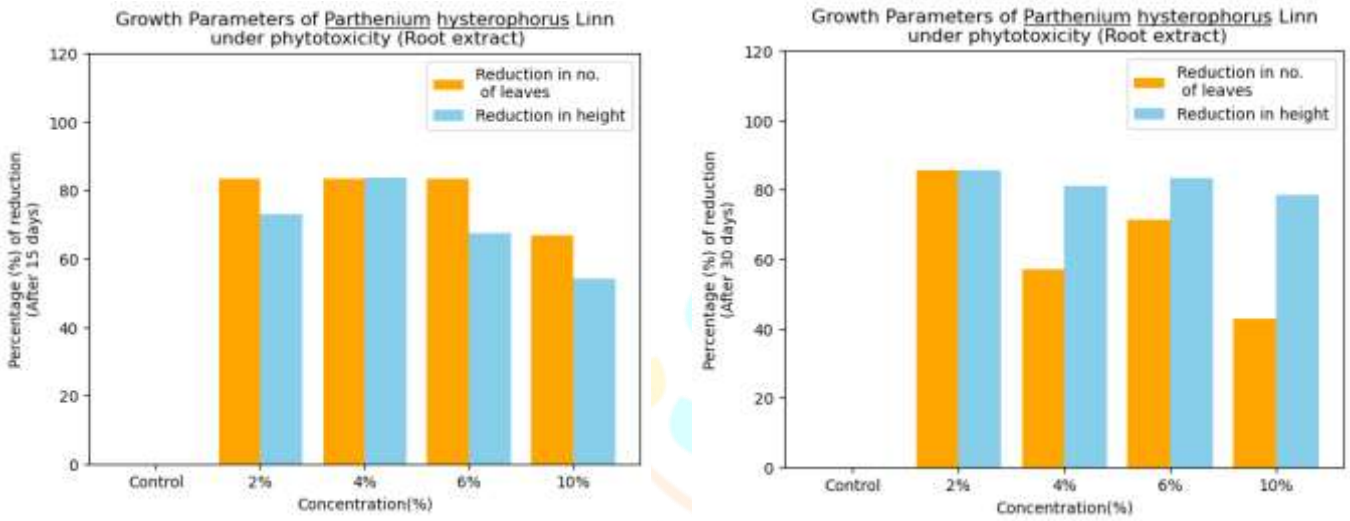
Table -1 Phytotoxic effect of *Ficus elastica Roxb.* on a growth and development of *Parthenium hysterophorus L.* after 15 days of sowing.

		(a) Root residue				(b)Stem residue				(c)Leaves 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	Production of leaves per plant after 15 days	Percentage (%) of reduction	Plant height after 15 days (cm)	Percentage (%) of reduction
1.	Control	06	-	3.7	-	06	-	3.7	-	06	-	3.7	-
2.	2 %	05	83.33	2.7	72.97	05	83.33	3.2	86.48	05	83.33	2.9	78.37
3.	4 %	05	83.33	3.1	83.78	05	83.33	3.6	97.29	05	83.33	3.2	86.48
4.	6 %	05	83.33	2.5	67.56	06	-	3.1	83.78	04	66.66	2.6	70.27
5.	10 %	04	66.66	2.0	54.05	05	83.33	2.9	78.37	04	66.66	2.2	59.45

Table -1 Phytotoxic effect of *Ficus elastica Roxb.* on a growth and development of *Parthenium hysterophorus L.* after 30 days of sowing

		(a) Root residue				(b)Stem residue				(c)Leaves 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	Production of leaves per plant after 30 days	Percentage (%) of reduction	Plant height after 30 days (cm)	Percentage (%) of reduction
1.	Control	07	-	4.2	-	07	-	4.2	-	07	-	4.2	-
2.	2 %	06	85.71	3.6	85.71	05	71.42	4.1	97.61	06	85.71	3.9	92.85
3.	4 %	04	57.14	3.4	80.95	05	71.42	3.8	90.47	06	85.71	3.6	85.71
4.	6 %	05	71.42	3.5	83.33	06	85.71	04	95.23	05	71.42	3.7	88.09
5.	10 %	03	42.85	3.3	78.57	05	71.42	04	95.23	04	57.14	3.1	73.80

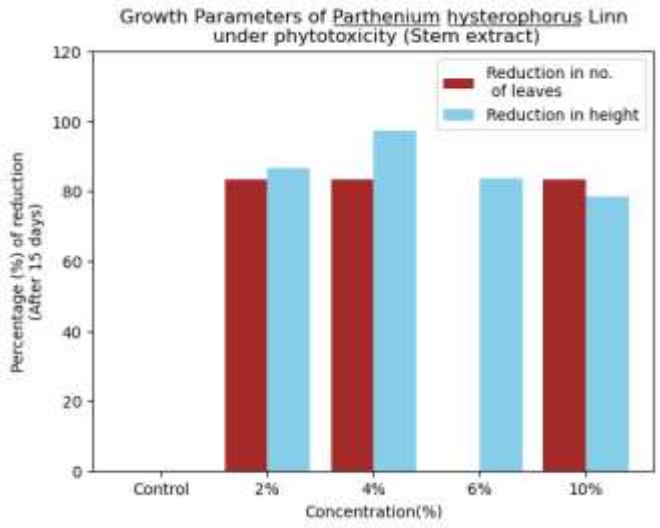
Table- 2 Biochemical constituents

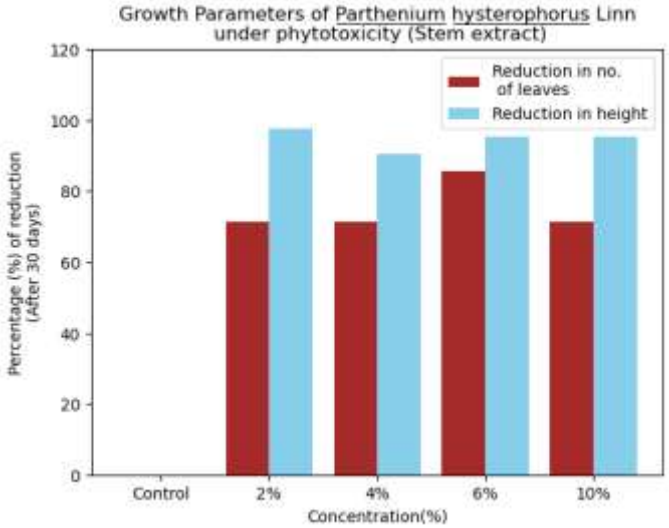


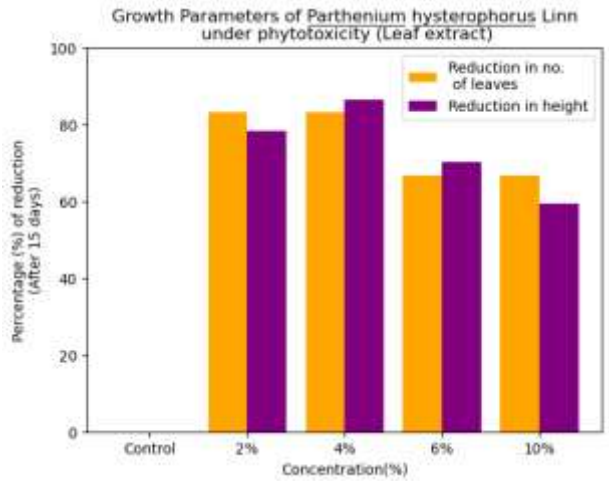
Effect of residues of root, stem and leaves of *Ficus elastica Roxb*.on *Parthenium hysterophorus L.*

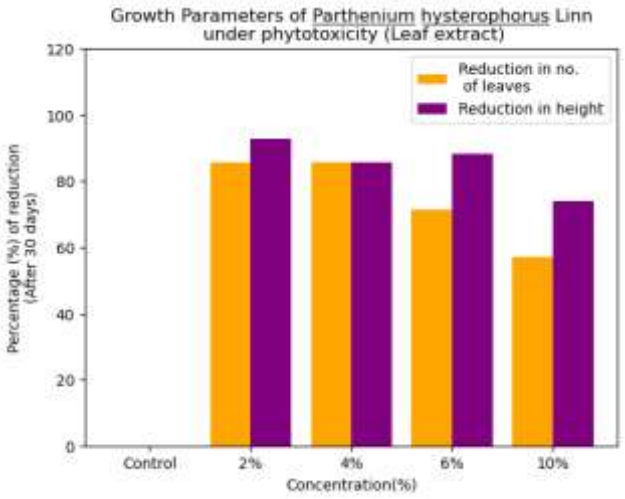
Sr.No.	Constituents	Control	Root residue				Stem residue				Leaves residue			
			2 %	4 %	6 %	10 %	2 %	4 %	6 %	10 %	2 %	4 %	6 %	10 %
1.	Chlorophyll a	39.32	42.38	36.06	32.83	35.66	31.97	46.01	38.19	22.15	15.40	17.25	14.80	25.22
2.	Chlorophyll b	234.0	203.62	182.46	172.67	162.14	141.38	125.32	140.22	148.14	167.15	179.39	144.39	113.13
3.	Total* Chlorophyll (a+b) (After 15 days)	273.35	246.1	218.65	205.55	197.8	173.45	171.4	178.5	170.5	282.75	196.65	159.3	138.55
4.	Polyphenol* (After 15 days)	15.57	9.62	8.42	6.31	6.11	4.60	4.60	6.40	10.52	4.60	6.31	5.26	4.20
5.	Protein* (After 30 days)	65.94	67.02	48.25	49.90	35.86	58.36	52.08	59.72	50.20	72.42	60.00	56.22	55.34
6.	Carbohydrade* (After 45 days)	38	17.6	13.92	10.00	08.33	33.53	34.82	15.23	08.43	16.4	13.33	11.53	06.20

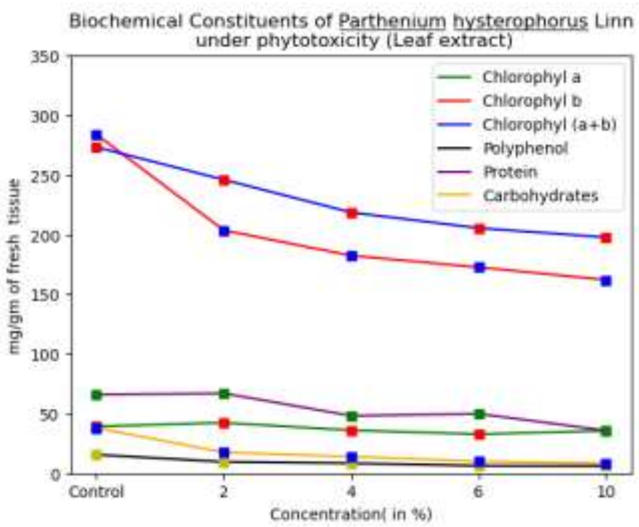
* Expressed as mg^{-1} g^{-1} of fresh tissue

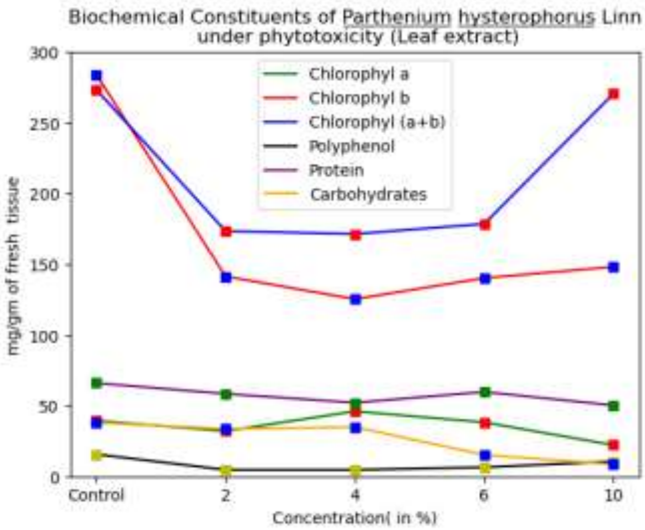









Biochemical Constituents of Parthenium hysterophorus Linn
under phytotoxicity (Leaf extract)
Chlorophyl a
Chlorophyl b
Chlorophyl (a+b)
Polyphenol
Protein
Carbohydrates
mg/gm of fresh tissue
Concentration(in %)
Control
2
4
6
10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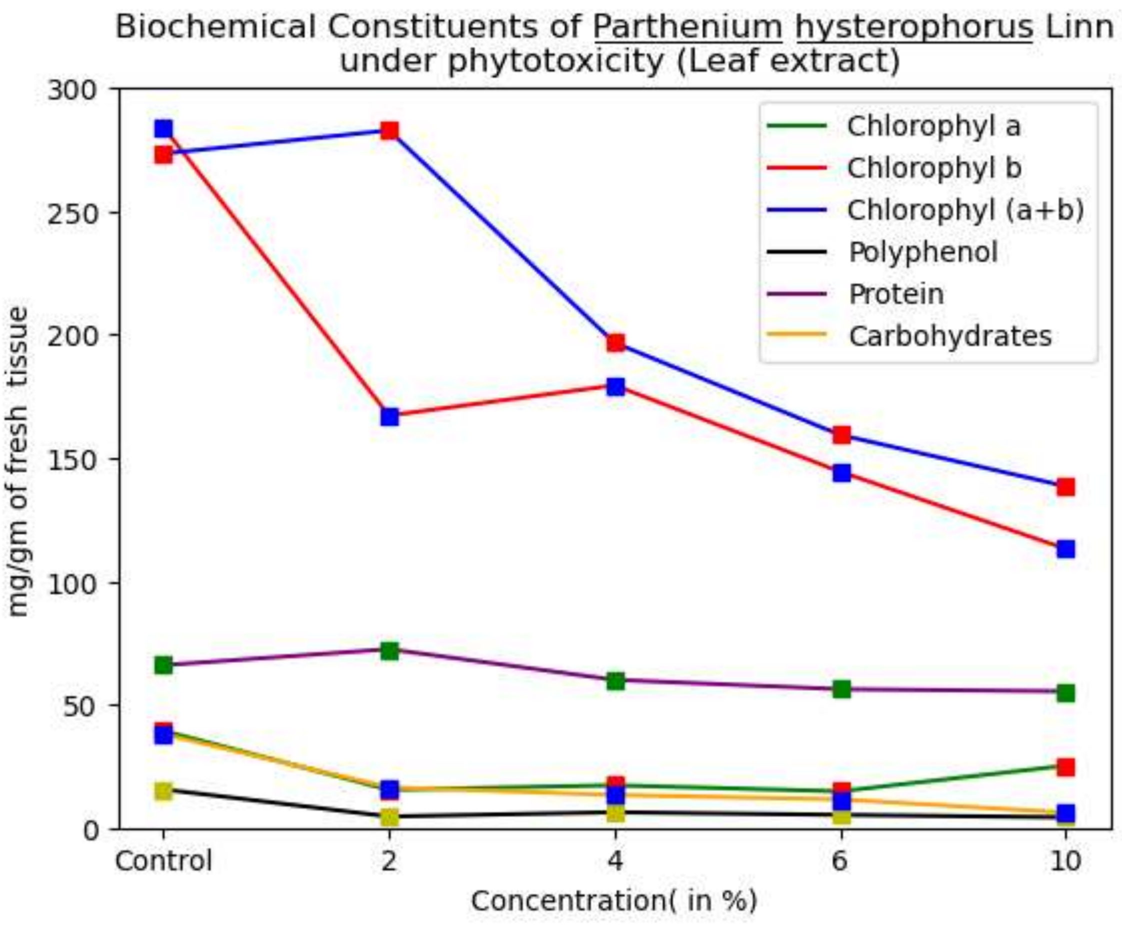
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Concentration(in %)
Control
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6
10

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