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Effect of Auxins on Primary Metabolites of Solanum Xanthocarpum Schard & Wendl.

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Abstract: *Solanum Xanthocarpum is popularly known as kateri, has sharp and prickly branches that are densely covered with rather minute star shaped hair. The fruit of Solanum Xanthocarpum contains carpesterol, solanocarpine and glucoside alkaloids. It also contains solanidine and solamine S. Solanum Xanthocarpum also contains sterols, alkaloids, carbohydrates, fatty and amino acids. The roots of Solanum Xanthocarpum are used widely as a medical ingredient that has been used by Ayurvedic herbalists for relieving common ailments. The herb can relieve problems of bronchial asthma, bronchitis and chronic cough. It is a laxative and carminative that is useful in acute cases of gastrointestinal problems. The present study pertains to the treatments of Auxins such as IAA & IBA in various concentrations to the plants and their effects on the production of primary metabolites as total sugar, reducing sugar, total soluble protein and TCA precipitated protein reported from the plant.*

Keywords*: Solanum xanthocarpum, Primary Metabolites, IAA, IBA, Total soluble sugar, Total soluble protein*

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I. Introduction

Solanum xanthocarpum, commonly known as *'Bhatkatiya' Kateri* belongs to *Solanacea* family. It has sharp and prickly branches that are densely covered with rather minute star shaped hair. The herb has yellow colored shining prickles that are of 1.5 cm in size. The sparsely hairy egg shaped leaves, purple colored flowers and round fruits. The fruit also has smooth seeds.

The *Solanum Xanthocarpum* is native to India. This herbal plant is usually found in wastelands of India and on the roadside as well as open scrublands. According to the Chhaterjee and Prakash(1995), the whole plant is alternative, antiasthematic, digestive,febrifuse, bitter and pungent. The fruits flower and stems are bitter and carminative and associated with a vesicular and watery eruption. The leaves are considered anodyne and their juice with black pepper is prescribed in rheumatism (Chopra *et al.* 1996). The herb can relieve problems of bronchial asthma, bronchitis and chronic cough. It is a laxative and carminative that is useful in acute cases of gastrointestinal problems.

The fruit of *Solanum Xanthocarpum* contains carpesteral, solanocarpine and glucoside alkaloids. It also contains solanidine and solamine S. The *Solanum Xanthocarpum* also contains sterols, alkaloids, carbohydrates, fatty and amino acids.

Medicinal plants plays an important role in human health care. Many of the plants have been an important source of medicine for thousands of years. The World Health organization (WHO) estimates that up to 80% of populations still rely on these traditional remedies. Herbal drugs are preferred over allopathic drugs on account of their efficacy, easy availability and are also said to be free from side effects. It is revealing to know that about 80% of modern drugs are derived from plants. Plant can be considered as famous chemical factory for biosynthesis of a huge array of primary and secondary metabolites and which many of these chemicals are utilized as medicine. The investigation carried out applications of phytohormones such as IAA and IBA on plants in increased the production of growth and biochemical composition.

II. Material And Methods

Preparation of cuttings - Shoots were collected separately from the vegetative plant of *Solanum xanthocarpum* in the month of July from the nearby premises of Pt. Ravishankar Shukla University, Raipur. Leaves and apical soft portion of the plants were excised and cut in to 15-20cm long pieces.

Treatment and Planting - The cuttings were dipped in 0.1% water suspension of Bavistin for 15 minutes. These cutting were, then, treated with 10, 50 and 100 ppm of Indole Acetic Acid (IAA) and Indole Butyric Acid (IBA). Control cuttings were treated with distilled water by dipping 2cm basal portion of the cutting for 24

hour's. After the treatment, cuttings were planted in earthen pots filled with soil and sand in 2:1 ratios. These were then kept under partial shade in net house and watered frequently to avoid desiccation.

Estimation of Primary Metabolites:

Plant extract was prepared by homogenizing 1 gm of plant tissue with 5 ml sodium-phosphate buffer (pH-7.2) with mortar and pestle and was centrifuged at 15,000 ppm for 20 min at 4°C. Finally, supernatant only was used for the estimation of total sugars, reducing sugars, soluble proteins and TCA precipitated proteins. Total sugar of plant tissue was estimated following Spiro (1966), Reducing sugar of shoot and root tissues was estimated following Wood *et al*. (1988), total water soluble protein and TCA precipitated protein was estimated following Lowry *et al*. (1951).

Estimation of total sugar:

Total sugar of plant tissue was estimated according to Spiro (1966). For this 50 µl aliquot was diluted to 1ml with distilled water and then 4ml of anthrone was added, gently. The whole mixture was vortexes and boiled for 10 min. in water bath and cooled in dark. Finally, absorbance was measured at 630nm by using UV-Vis spectrophotometer (Jasco-Japan).The final concentration of reducing sugar in filtrate was determined by preparing a calibration curve of standard Glucose solution and expressed in terms of total sugar mg/g plant tissue.

Estimation of total sugar:

Reducing sugar of plant tissue was estimated according to Wood *et a*l (1988). For which 200µl aliquot was diluted to 5ml. To this was added 1ml of Somogyi reagent and was boiled on water bath for 20 min. After cooling, 1 ml of arsenomolybdate reagent was added to it and vortexed to complete the mixing. After 15min. absorbance was measured with the help of UV-Vis spectrophotometer (Jasco-Japan) at 500nm. The final concentration of total sugar was determined with calibration curve of standard Glucose solution and expressed in terms of reducing sugar mg/g plant tissue.

Estimation of Total Water Soluble Protein:

Total Water Soluble Protein was estimated according to Lowary *et al* (1951). For which 50 µl aliquot was diluted up to 1ml with distilled water. To this was added 5ml of alkaline reagent and was vortexed for complete mixing. Then 0.5 ml of folinciocaltue reagent was added. Vortexed and allowed to develop colour for 20 min at room temperature. The absorbance was measured with the help of UV-Vis spectrophotometer (Jasco-Japan) at 750nm. Protein concentration was determined with the help of calibration curve prepared from standard protein and expressed in mg/g plant tissue.

Estimation of TCA precipitated Protein:

Protein was precipitated by adding 1ml of 10% TCA to 1ml of aliquot. The sample was centrifuged for 15 min. at 3000 rpm and pellet was obtained containing proteins. It was washed with ethanol: Ether (1:1) and re-centrifuged for 15 min. Again pellet was collected and dissolved in 2.5 ml of 1N NaOH. This was used for the estimation of TCA precipitate protein following the method of Lowary *et al* (1951).

III. Result and discussion

ESTIMATION OF PRIMARY METABOLITES:

Total and reducing sugar:

100ppm IBA treated cuttings showed maximum amount of total sugar in leaf, stem and root, with 18±0.435 mg/g, 13.8±0.688 mg/g, 12.9±0.328mg/g respectively. The minimum amount was found in10ppm IAA treated cuttings was 12.96± 0.08mg/g, 11.53± 0.841mg/g and 11.1± 0.10mg/g in leaf, stem and root respectively as compared to control. (TableNo.1)

The amount of reducing sugar was also maximum in 100pp IBA treated cutting in leaf and stem were 1.96±0**.**088mg/g, 1.46±0.088 mg/g, respectively, and in root it was maximum in 1.26±0**.03** mg/g in IAA 50ppm treated cuttings. The minimum amount 1.26±0.088 mg/g**,** 1.13±0.088 mg/g was found in IAA 10ppm treated cuttings and in root 0.633±0.133 mg/g was found in IBA 50ppm treated cuttings respectively as compared to control.. (TableNo.2)

Total soluble and TCA precipitated proteins:

The maximum amount of soluble protein was 39.53± 0.721mg/g, 23.2± 0.527mg/g , and 16.56± 0.033 mg/g was found with IBA100 ppm treated cuttings of leaf , root and stem respectively. The minimum amount 30.2± 0.433mg/g, 14.03 ±0,463mg/g and 12.36± 0.323 mg/g in root leaf and stem of IAA 10ppm treated cuttings as compared to control. (TableNo.3).The amount of TCA precipitate protein was maximum in leaf and

stem was 10.8± 1.44 mg/g, 2.63 ±0.753 mg/g respectively of IBA100ppm treated cuttings but in root it was maximum 3.6±0.264mg/h, in IAA 100ppm treated cuttings. The minimum amount **6.03±0.120** mg/g, and **2.03±0.881**mg/g and **1.26±0.03**mg/g in leaf stem and root respectively as compared to control. (TableNo.4)

Table 1: Estimation total sugar in cuttings of *s. xanthocarpum* treated with 10, 50, 100ppm of IAA and IBA.

Concentrations of Auxin	Leaf (mg/g)	Stem (mg/g)	Root (mg/g)
Control	9.53±0.328	10.7±0.115	10.1±0.11
10ppm IAA	12.96±0.088	11.53±0.841	11.1±0.10
50ppmIAA	13.0±0.115	12.73±0.589	11.46±0.280
100ppmIAA	15.46±0.088	13.06±0.463	12.53±0.841
10ppm IBA	14.36±0.120	11.56±0.318	11.9±0.141
50ppm IBA	14.83±0.145	12.9±0.317	12.50±0.313
100ppmIBA	18±0.435	13.8±0.688	12.9±0.328

Table 2:Estimation of reducing sugar in cuttings of *S. xanthocarpum* treated with 10, 50,100ppm of IAA and IBA.

Concentrations of Auxin	Leaf (mg/g)	Stem (mg/g)	Root (mg/g)
Control	0.633±0.133	0.766±0.033	0.853±0.033
10ppm IAA	1.26±0.088	1.13±0.088	0.80±0.057
50ppmIAA	1.6±0.057	1.2±0.057	1.26±0.03
100ppmIAA	1.8±0.043	1.26±0.03	0.8±0.057
10ppm IBA	1.46±0.088	1.13±0.066	0.7±0.01
50ppm IBA	1.76±0.035	1.2±0.057	0.633±0.133
100ppmIBA	1.96±0.088	1.46±0.088	0.966±0.325

Table 3:Estimation of total soluble protein in cuttings of *S. xanthocarpum* treated with 10, 50, 100ppm of IAA and IBA.

Concentration of Auxin	Leaf (mg/g)	Stem(mg/g)	Root (mg/g)
Control	22.63±1.37	10.36±0.72	11.9±0.17
10ppm IAA	30.2±0.43	14.03±0.46	12.36±0.32
50ppmIAA	39.36±0.03	14.8±0.17	23.13±0.86
100ppmIAA	33.26±0.37	10.36±0.18	12.63±0.79

10ppm IBA	**35.83±0.36**	**10.56±0.03**	**12.36±1.15**
50ppm IBA	**38.5±0.665**	**13.33±0.03**	**15.3±0.32**
100ppmIBA	**39.53±0.72**	**16.56±0.46**	**23.2±0.52**

Table No.4:Estimation of TCA precipitated protein in cuttings of *S. xanthocarpum* treated with 10, 50, 100ppm of IAA and IBA.

Concentrations of Auxin	Leaf (mg/g)	Stem(mg/g)	Root (mg/g)
Control	**3.43±0.120**	**1.1±0.06**	**1.66±0.881**
10ppm IAA	**6.03±0.120**	**2.03±0.881**	**1.26±0.03**
50ppmIAA	**9.83±0.207**	**2.06±0.392**	**2.13±1.207**
100ppmIAA	**7.9±1.40**	**2.08±0.1**	**3.6±0.264**
10ppm IBA	**6.86±1.785**	**1.1±0.057**	**2.63±0.266**
50ppm IBA	**7.83±1.91**	**1.46±0.202**	**2.53±0.202**
100ppmIBA	**10.8±1.44**	**2.63±0.753**	**2.76±0.88**

IV. Conclusion

IAA and IBA both has a good potential in improving accumulation of biochemical composition. Treating stem of *Solanum xanthocarpum* IAA is found to be more effective in improving total sugar content. The amount of total sugar was maximum found in leaf, stem and root respectively of 100 ppm treated cuttings on IBA. Maximum amount of reducing sugar was fond with leaf and stem respectively of IBA100ppm treated cuttings but in root it was maximum in 50ppm treated cuttings of IAA. The maximum amount of total soluble protein was found with IBA 100ppm and IAA 50ppm treated cuttings of leaf and root respectively. But in stem it was maximum in IBA100ppm treated cuttings. The maximum amount of TCA precipitated protein in leaf and stem respectively in IBA 100ppm treated cuttings but in root it was maximum in IAA 100ppm treated cuttings. So, the medicinal plants cultivars may be advised to make up of IAA & IBA for improving biomass and metabolites content in *Solanum xanthocarpum*.

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