

## CHANGES IN CARBOHYDRATE CONTENTS AND HYDROLYSING ENZYMES IN STEM GALL OF *CORIANDRUM SATIVUM* L. CAUSED BY *PROTOMYCES MACROSPORUS* IN VIVO AND IN VITRO

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Changes in total soluble sugar, starch contents and alpha-amylase activity in stem gall of Coriander (*Coriandrum sativum* L.) caused by the fungus *Protomyces macrosporus* were investigated. An increase in total soluble sugars and alpha-amylase activity was recorded in gall tissues as compared to its normal counter parts, both *in vivo* and *in vitro*. However normal tissue showed higher starch contents than galled tissues, hence this could be co-related to high alpha-amylase activity in the galled tissue.

**Keywords :** *Coriandrum sativum*; *in vitro*; *in vivo*; *Protomyces macrosporus*.

*Coriandrum sativum* L. var. RC-41 (Dhania) is grown in fields for green leaves and dry fruits used as a condiment. Coriander suffers severely from stem gall disease caused by the fungus *Protomyces macrosporus*. A preliminary survey has shown that more than 50% loss in yield occurs due to this disease in Kota, Bharatpur, Dholpur, Jaipur and adjoining areas. The disease appears in the form of tumour like swellings on veins, leaf stalks, peduncle and other above ground parts. When inflorescence is attacked seed production is drastically reduced, causing colossal loss of revenue to the nation.

The present study was undertaken to work out the changes in total soluble sugars and starch contents and alpha-amylase activity both *in vivo* and *in vitro*. Fresh normal and gall (Hypertrophied) tissues were used for *in vivo* estimation. Normal and gall tissues of stem of coriander were isolated and maintained on MS medium<sup>1</sup> supplemented with NAA (8.0 mg/l), kinetin (0.5 mg/l) and 2,4-D (2.0 mg/l). Thirty days old normal and gall tissue cultures were used for *in vitro* estimation.

Total soluble sugars and starch contents were estimated by the method of Dubois *et al.*<sup>2</sup> and alpha-amylase activity by the method of Schuster and Gifford<sup>3</sup> with slight modification.

Table 1 shows high total soluble sugars and alpha-amylase activity as compared to its normal counterpart, both *in vivo* and *in vitro* conditions. However, higher starch contents were recorded in normal as compared to galled tissues hence low starch contents in galled tissues could be co-related to high alpha-amylase activity in the same. Such results were also obtained earlier in various host plants infected by obligate pathogen showing abnormal growth<sup>4-6</sup>.

Increase in total soluble sugar may be due to its accumulation as a result of disruption of normal phloem transport or its translocation from the neighbouring healthy tissues (source) to the physiological 'Sink'. Reduction in the starch content in gall tissues may be due to utilization of these substances by the pathogen for its growth and development. The increase in sugar content was parallel to the activity of this enzyme.

**Table 1.** Total soluble sugars and starch contents and alpha-amylase activity in normal and stem galls of *Coriandrum sativum* *in vivo* and *in vitro*.

	<i>in vivo</i>		<i>in vitro</i>	
	Normal stem	Stem gall	Normal callus	Gall callus
Total soluble sugars (mg/g fresh weight)	3.20	4.25	3.55	4.45
Starch (mg/g fresh weight)	8.73	7.20	8.55	7.92
Alpha-amylase (mg starch hydrolysed/hr/mg protein)	1.19	1.26	1.20	1.33

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