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ASCORBIC ACID METABOLISM AND GROWTH IN NEMATODE INDUCED ROOT GALL AND NORMAL TISSUE CULTURES OF *SOLANUM MELONGENA*

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Effects of various concentration of ascorbic acid on the growth and the production of endogenous ascorbic acid in normal and nematode induced gall tissues of brinjal *(Solanum melongena)* were studied *in vitro*. Ascorbic acid enhanced the growth of normal tissue while it inhibited the gall tissue. Cultures of various ages showed increase in endogenous ascorbic acid content in both the tissues when grown on different concentrations of ascorbic acid. Higher ascorbic acid recorded in gall tissues than in normal, both *in vitro* and *in vivo* conditions.

Keywords : Ascorbic acid; Growth; Nematode; Root gall; *Solanum melongena;* Tissue culture.

Introduction

Importance of ascorbic acid as growth regulator, its biosynthesis in germinating seedling and in actively growing cells has been well documented[1,2]. However there is no report on the ascorbic acid metabolism in nematode induced root galls. The present communication deals with the effect of various concentrations of exogenous ascorbic acid on the growth and production of endogenous ascorbic acid in normal and gall tissues of brinjal (*Solanum melongena)* in culture. Ascorbic acid contents of root gall and normal root tissues *in vivo* conditions were also determined.

Material and Methods

Normal and gall tissues of brinjal (*Solanum melongena)* were isolated from the normal root (hypocotyl) and nematode (*Meloidogyne incognita)* induced root galls, respectively. The tissues were maintained on MS-medium[3] supplemented with 10.0 mg/l NAA, 0.08 mg/1 Kinetin, 8.0 g/1 agar and 30.0 g/1 sucrose. For this particular experimentation tissue pieces (about 200 mg each) were incubated in dark at 26 ± 2°C and around 55% relative humidity.

Various concentrations of ascorbic acid ranging from 50-800 ml/1 were incorporated in the medium.The media were adjusted to pH 5.8 before autoclaving at 1.06 Kg/cm^2 and for 15 minutes. In control experiments the ascorbic acid was eliminated from the medium. Each combination was replicated six times and each experiment was repeated thrice. After an incubation period of 15, 30 and 45 days, the tissues were harvested separately and the fresh weight was determined. These tissues were used for the estimation of ascorbic acid content at different levels of ascorbic acid in the medium and at different ages of cultures. Ascorbic acid contents under *in vivo* conditions were also determined using normal (healthy) root parts and nematode induced root galls from 80 days old brinjal plants, grown in experimental field soils. The free ascorbic acid contents of normal and gall tissues, both *in vitro* and *in vivo* conditon, were estimated using Jensen[4] method and the results were presented in mg/ 100 g fresh weight of the tissues.

Results and Discussion

Growth of the normal tissue increased with increasing concentrations of ascorbic acid with optimum at 100mg/1, while the growth of gall tissue was adversely affected by ascorbic acid in the medium (Fig. 1). All the concentrations of ascorbic acid were inhibitory for the growth of the gall tissue with maximum growth in control experiments without ascorbic acid. Responses of ascorbic acid depend on the type of plant or plant parts and the origin of the tissues. Ascorbic acid inhibited callus formation in sunflower tissues[5] but it enhanced the growth of *Picea glauea* tissues grown *in vitro*[6] . Higher concentrations (above

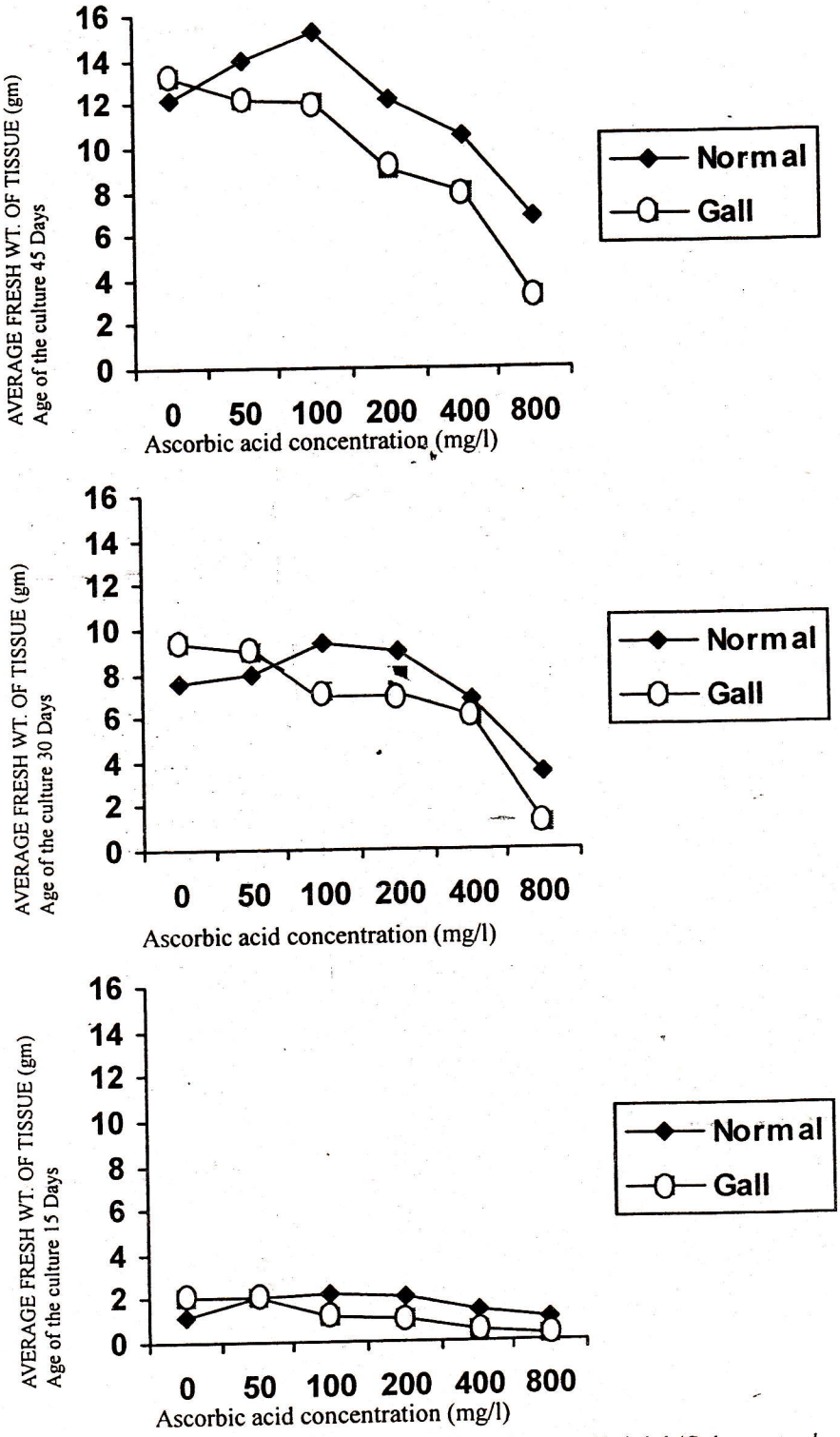

Fig. 1. Comparative growth of normal and gall tissues of brinjal (*Solanum melongena)* on MS-medium supplemented with different concentrations of ascorbic acid at various ages.

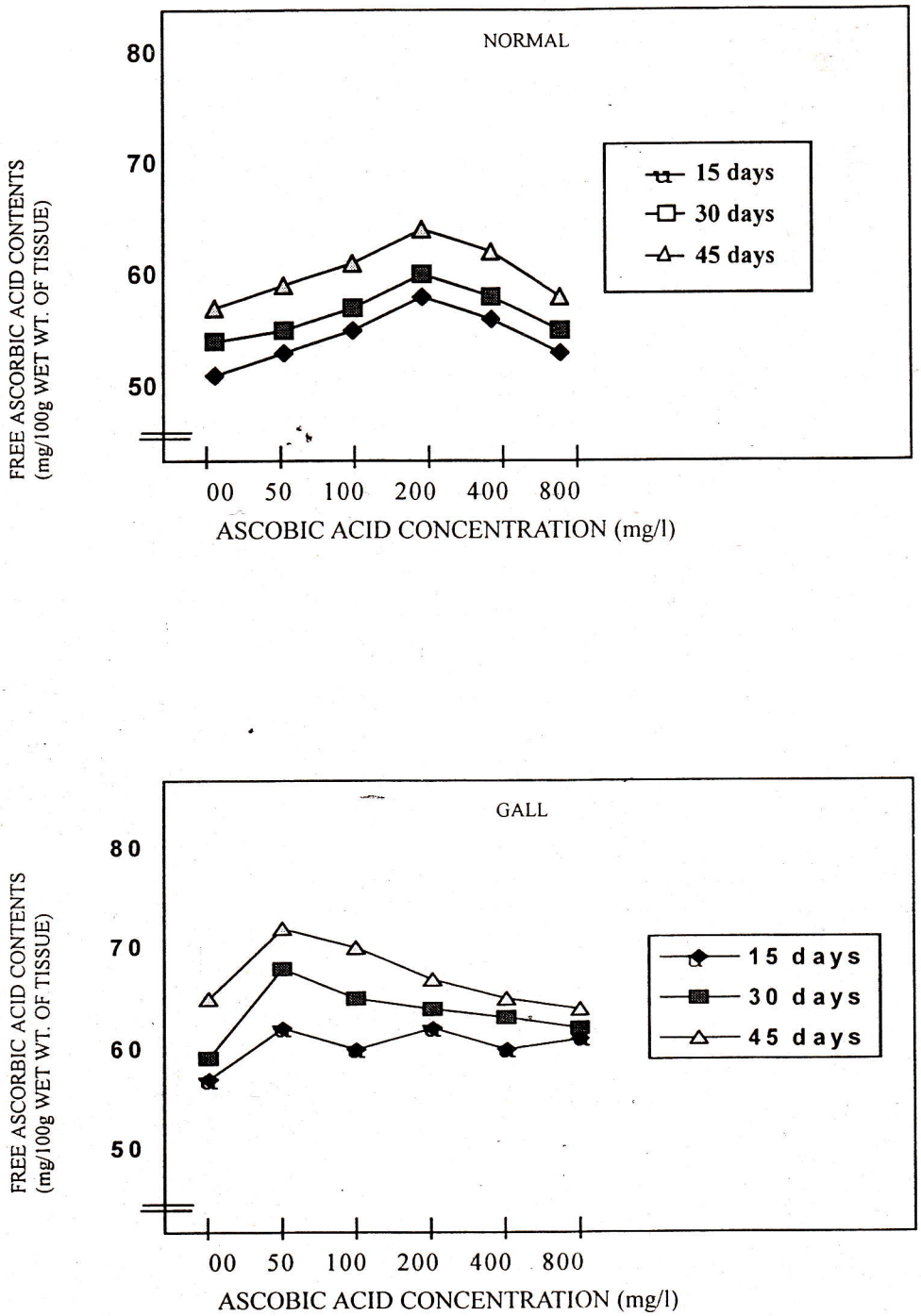

Fig. 2. Ascorbic acid contents of normal and gall tissues of brinjal (*Solanum melongena)* on MS-medium supplemented with different concentration of ascorbic acid.

Table. 1. Ascorbic acid contents of normal and gall tissues of brinjal (*Solanum melongena*) *in vitro* and *in vivo*.

Free Ascorbic acid (mg/100g wet wt. of tissue)			
In vitro (30 d old cultures)		*In vivo* (80 d old plants)	
Noramal callus	Gall callus	Normal root	Root gall
51	57	16	24

optimum) of ascorbic acid reduced the growth of normal tissue of tomato.

The normal and gall callus tissues of all the ages showed increase in free ascorbic acid with maximum being at 200 mg/l and 50 mg/l of exogenously supplied ascorbic acid for normal and gall tissues, respectively (Fig.2). The production of ascorbic acid is reported from tissue cultures of *Datura metal* and *D. tatula*[7]. Ascorbic acid contents were reduced in both the tissues at higher levels (above optimum) of ascorbic acid in the medium. In the present studies under *in vitro* condition, gall tissues showed higher amounts of ascorbic acid than the normal tissues (Table 1). Similarly under *in vivo* condition the root gall tissues showed higher amounts of ascorbic acid than the normal tissues. Increase in the ascorbic acid as a result of fungal infection and disease development is also reported[8]. But on the other hand Subramanian[9] noted reduction in ascorbic acid contents in pigeon pea, after inoculation with *Fusarium udum*. The root galls of tomato induced by nematode also showed accumulation of ascorbic acid and its related enzymes when compared to healthy root tissue[10].

These observations reflected variation in the metabolic capabilities of the normal and gall tissues in culture.

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