EFFECT OF RED AND BLUE RADIATION ON RESYNTHESIS OF CHLOROPLAST PIGMENTS IN EMBRYOS OF *DOLICHOS LABLAB* L.

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CHLOROPHYLL-BEARING embryos (chloro-embryos) are widely distributed in angiosperms. Total blockade of light by masking the fruits of *Dolichos lablab* by light proof black paper *in vivo* led to the formation of etiolated embryos and the etiolated embryos are able to resynthesize chloroplast pigments upon illumination under *in vivo* condition[1]. Most of the studies on the effect of red and blue light on chlorophyll biosynthesis in higher plants are concentrated on leaves and their effects on embryos are yet to be investigated. The aim of the present study is to find out the effect of red and blue radiation (separately and in combination) on resynthesis of chloroplast pigments in the etiolated embryos of *Dolichos lablab*, *in vivo*.

The plants of *Dolichos* were raised in the University garden. For etiolation, young fruits (8 to 9 days after anthesis were masked *in vivo* with light proof black paper and left under field condition[1]. Four to five days after masking (12–13 days after anthesis) when the fruits had fully etiolated embryos, the mask was removed and remasked with red (610–745 nm) or blue (425–490 nm) plastic sheets separately and in combination with blue (outer) + red (inner) or red (outer) + blue (inner), *in vivo* and left under field condition. The change of the mask was effected in the field before sun rise. Control fruits were exposed to natural light without any masking. Resynthesis of chloroplast pigments in the etiolated embryos under these radiations was examined after 48 h. Chlorophyll content was determined following the method of Arnon[2] and carotenoid content by Goodwin's method[3]. The light transmitted through the plastic sheets was calculated with LI-188B integrating quantum/radiometer (LI-COR, USA).

Table 1 *Intensity of light transmitted by red and blue plastic sheets separately and in combination (mean values of 5 different measurements)*

Plastic sheet	Transmission (Wm^{-2})	% Control
Unfiltered light	92	100.00
Red	83	90.22
Blue	74	80.44
Red (outer) + blue (inner)	69	75.00
Blue (outer) + red (inner)	68	73.81

The intensity of light transmitted by red plastic sheet (90%) was higher than blue (80%), whereas the transmission of light by red (outer) + blue (inner) and blue (outer) + red (inner) combinations were quite comparable (table 1). Under natural condition, the intensity of sunlight reaching the embryo through the fruit wall and seed coat of *D. lablab* was 13% which is sufficient for chlorophyll synthesis[4]. In *D. lablab* chlorophyll synthesis was initiated at the cotyledonary stage 7–8 days atter anthesis and the maximum content of chlorophyll was observed 15 days after anthesis and the pigments disappeared gradually after that period[4]. The etiolated embryos formed as a result of masking did not contain any detectable chlorophyll but had a trace of carotenoids[1].

Chloroplast pigments were resynthesized upon red and blue radiations and their combinations, and

Table 2 *Effect of red and blue radiation as well as by a combination of red (outer) + blue (inner) and vice versa on chlorophyll resynthesis in the etiolated embryos (48 h) of Dolichos, in vivo (mean values of three different experiments)*

Light treatment (plastic sheet)	1	2	3	4	5	6	7	8	9
	$\mu g\ gfwt^{-1}$								
Zero hour (at the time of remasking)	0.0	–	0.0	–	0.0	–	0.0	3.19	–
Control	36.64	100.00	25.97	100.00	10.67	100.00	2.43	12.96	100.00
Red	41.20	112.45	27.92	107.51	13.29	124.56	2.10	13.02	100.46
Blue	13.42	36.63	8.99	34.62	4.43	41.52	2.03	4.84	37.35
Red (outer) + blue (inner)	22.88	62.45	15.22	58.61	7.67	71.88	1.98	7.81	60.26
Blue (outer) + red (inner)	15.11	41.21	10.21	39.32	4.89	45.83	2.09	6.30	48.61

1, Total chlorophyll; 2, % Control; 3, Chlorophyll *a*; 4, % Control; 5, Chlorophyll *b*; 6, % Control; 7, Chlorophyll *a*/*b* ratio; 8, Carotenoids, 9, % Control.

the chlorophyll *a/b* ratio in all the treatments did not show any marked difference (table 2). As compared to the control, the red radiation enhanced the level of the total chlorophyll marginally (13%) whereas the blue radiation led to a sharp decrease in synthesis of chloroplast pigments (table 2). Earlier workers have observed that red light greatly enhanced the formation of chloroplast pigments than blue light in barley seedlings[5], *Pinus sylvestris*[6] and in green embryos of *Dolichos*[1]. However, in certain algae and higher plants, the synthesis of chloroplast pigments was higher in blue radiation than in the red[7-9]. The red radiation enhancement of the chlorophyll formation[10] over the blue radiation is rather intriguing as blue radiation regulates δ-aminolevulinic acid formation as well as certain steps involved in the production of reductant required for photoreduction of protochlorophyll to chlorophyll[11,12].

As compared to red radiation, red (outer) + blue (inner) or vice versa combinations reduced the synthesis of pigments (table 2). Although the intensities of light transmitted by these combinations were similar (but less when compared to blue plastic sheet as in table 1), the formation of chlorophyll was marginally higher under red (outer) + blue (inner) combination than in blue radiation or blue (outer) + red (inner) combination. While this is suggestive of phytochrome control, the exact mechanism for the enhancement of chlorophyll in this combination [red (outer) + blue (inner)] is not clearly understood.

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HISTOPATHOLOGICAL STUDIES IN THE NEMATODE GALLS OF ROOT OF *SOLANUM SURATTENSE*

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SOLANUM SURATTENSE Burm F. is a member of the family Solanaceae. This prickly herb is found along the road side, bunds of canals, raised borders of crop fields and such other places where soil is freshly dug and piled. This plant is used in different human and cattle ailments.

Root nematodes of angiosperm have been studied by several workers[1-4]. However, a study of this type has not been undertaken on *S. surattense*. An effort has therefore been made during the present investigation to study the nematode galls of roots of this plant.

For the present study, the normal and infected roots of *S. surattense* were collected from the fields of Rewa, fixed in FAA at 25°C for 24 h and preserved in 70% alcohol. The pieces of normal and infected roots were dehydrated and cleaned in alcohol xylol and tertiary butyl alcohol and embedded in paraffin wax. The roots were then sectioned at 5–11 μ by microtome. Haupt's adhesive was used for affixing the section on the slide. To understand the mode of nematode infection and host parasite relationship, the microtome sections of normal and infected roots, were stained with Heidenhain's and Delafield's haematoxylin and safranin fast green combination[5].