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# Changes in carbohydrate in '*Khesari*' (*Lathyrus sativus*) due to downy mildew disease

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**Abstract :** There was a gradual decrease in total starch, total reducing sugar and all the individual sugars in the leaflets of *Khesari* due to downy mildew disease Non-reducing sugar tended to increase. Glucose-1-phosphate and glucose-1, 6-diphosphate in diseased plant.

**Keywords :** '*Khesari*' (*Lathyrus sativus*), downy mildew disease, carbohydrates

The downy mildew of *Khesari* caused by *Peronospora lathyri-palustris* Gaum. is a serious disease of cold and humid regions of India. The change in respiration of the inoculated plant has earlier been worked out (Sinha *et al.,* 1991). The present paper deals with the change in the level of various carbohydrates.

## MATERIALS AND METHODS

Ten plants of local variety of *Lathyrus sativus* L were raised each in garden soil filled in six earthern pots each having 25 cm top diameter, 15 cm base diameter and 25 cm depth. Plants were raised in the first week of November 1994. Watering was maintained weekly. After two months of growth, the plants of three pots were inoculated modifying Lal (1984) and maintaining control of uninoculated plants of remaining three pots. Sporangia as inoculum were taken from heavily infected leaflets of the same variety of *Khesari*. Their number was adjusted to $5 \times 10^2$/ml of 0.5% Tween 20 in sterilized conductivity water. The pots were maintained under humid chamber made of black opaque polythene sheet supported by aluminium frame at 20°C for 48 h. The pots were transferred to diffused light still maintaining the same humidity at 25°C for 3 days and then to a humid corner of a garden. The estimation of the particulars were made at an interval of 10 days and total for 30 days after appearance of symptoms of disease i.e. on the 11th day of inoculation.

Starch was determined colorimetrically (Snell and Snell, 1961) after desugaring 2g of leaflets and dissolving the starch with perchloric acid. Total sugar (TS) was determined using Anthrone reagent (Snell and Snell, 1961). Reducing sugar (RS) was calculated following Miller (1972). Non-reducing sugar (NRS) was estimated by substracting the value of RS from TS. TLC method was adopted for separation of individual sugars and sugar phosphates (Benson, 1955). The quantitative value of these sugars was determined as stated for TS after elution.

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## RESULTS AND DISCUSSION

There appeared (Table 1) gradual decrease in starch, TS, and RS. NRS increased. Among sugars i.e. D-glucose, D-fructose, maltose,sucrose and raffinose, that were detected in the plant, decreased due to progression in disease. The decrease of first two sugars was maximum. Glucose-1-phosphate and glucose-1, 6-diphosphate were more in diseased plant which too tended to gradual decrease.

The loss in starch, TS and RS points out reduction in the content of diseased leaf either due to their disturbed synthesis or utilization of the organic matter already synthesized there. Starch, TS, RS and NRS were deficient in the galled tissue of coriander due to *Protomyces macrosporus* (Prasad *et al.*, 1989). Padmanabhan *et al.* (1988) observed increase in RS in susceptible variety of sugarcane due to *Ustilago scitaminea.* Increase in sugar phosphate is expected due to respiration as it has been found stimulated (Sinha *et al.*, 1991).

The activity of the enzymes related with carbohydrate metabolism has been reported to be enhanced in the present host resulting in the dissolution of polymeric nutrient due to disease (Yadav, 1989). The deficiency of the carbohydrates noted above and mineral content in this host (Sinha, 1989) render it in a plight of hunger and metabolic derangement.

**Table 1 :** Level of carbohydrates (mg/g fresh weight of leaflets) in *Khesari* due to downy mildew disease

| Particulars | Diseased plant (Day of observation) | | | Healthy plant (Day of observation) | | |
|---|---|---|---|---|---|---|
| | 10th | 20th | 30th | 10th | 20th | 30th |
| Starch | 31.67 | 26.38 | 21.07 | 38.64 | 39.02 | 39.98 |
| Total sugar | 30.96 | 30.29 | 29.72 | 64.65 | 64.92 | 65.27 |
| Reducing sugar | 23.74 | 22.53 | 21.16 | 31.58 | 31.98 | 32.15 |
| Non-reducing sugar | 7.67 | 8.19 | 8.61 | 32.47 | 32.89 | 33.11 |
| D-glucose | 12.83 | 11.67 | 10.05 | 24.49 | 24.86 | 25.03 |
| D-fructose | 5.17 | 5.02 | 4.71 | 17.76 | 17.97 | 18.18 |
| Maltose | 3.88 | 3.46 | 2.34 | 3.97 | 4.17 | 4.24 |
| Sucrose | 8.85 | 8.21 | 7.60 | 13.06 | 13.21 | 13.39 |
| Raffinose | 4.27 | 3.83 | 3.51 | 4.67 | 4.81 | 5.06 |
| Glucose-1-phosphate | 0.587 | 0.512 | 0.465 | 0.312 | 0.286 | 0.272 |
| Glucose-1, 6-diphosphate | 0.928 | 0.842 | 0.782 | 0.593 | 0.562 | 0.515 |

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