

Particularly arginine, aspartic and glutamic acids, tend to accumulate in sugar beet leaves affected by the curly top virus, while DIENER¹² showed that virus-infected peach leaves contained higher proline content than the healthy ones. REINDEL and BIENENFELD¹³ proved that the leaf roll induced a high soluble nitrogen content of potato leaves mostly phosphorus containing peptides.

Effect of tobacco mosaic virus on the carbohydrate content of tobacco leaves. Table II represents the mean values of the different carbohydrate fractions present in both healthy and diseased leaves. The Table shows clearly that virus infection seemed to have no significant effect on the different soluble carbohydrate fractions of tobacco leaves. Furthermore, in spite of the fact that the total polysaccharide content was more or less similar in both diseased and healthy leaves, yet the glucosan content was higher and the galactosan content was lower in the former than in the latter.

These results indicate that the only effect of the virus on the carbohydrate metabolism seemed to be the activation of starch phosphorylase accompanied by retardation of hexose isomerase. This contradicts the observations of STANGE¹, who found that the concentration of sucrose,

glucose and fructose was always higher in the sugar beet leaves affected with virus yellows than in the healthy ones.

Zusammenfassung. Der Tabakmosaikvirus vermehrte den Gehalt an Protein- und Peptidstickstoff in den befallenen Tabakblättern, wirkte aber weder auf die totalen Kohlehydrate noch auf die Kohlehydratfraktionen. Hingegen wurde eine gewisse Beschleunigung der Glukosanbildung nachgewiesen, ein Phänomen, das von einer gleichzeitigen Abnahme der Galaktosanbildung begleitet war.

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¹² T. O. DIENER, *Phytopathology* 50, 141 (1960).

¹³ F. REINDEL and W. BIENENFELD, *Hoppe-Seyler's Z.* 303, 262 (1956).

Chlamydospore Germination and Artificial Culture of *Protomyces macrosporus* Unger

Coriander (*Coriandrum sativum* L.) suffers recurrently from a 'stem gall' disease, incited by *Protomyces macrosporus* Unger which is widely distributed in the country. The infection stimulates development of linear to fusoid, coalescent gall-like swellings over the stem surface and twirling 'goose-neck' shoots during preflowering period of the host. Abundant chlamydospores develop intercellularly in the hypertrophied tissues providing primary inoculum for the pathogen in the following crop season.

During the course of investigation, mature galls were collected in March-April 1963, stored under low temperature conditions and a portion was weathered out of doors. Periodical tests for chlamydospore germination gave negative results. Earlier, POPTA¹, VON BUEREN², and BUTLER³ reported their germination, while TUBAKI⁴ indicated termination of the dormancy period as prerequisite for it. Chlamydospores were fixed onto the slides by alternate wetting and drying and inverted over wet cotton for moisture condensation^{5,6}. Less than 25% chlamydospores from both the lots kept for 4 months in storage germinated at room temperature (22 to 24°C) after prolonged incubation. Immersion of the spores in water for over a week was favourable to help break the thick exospore^{3,4}. The hard thick exospore was possibly blocking the germination which was apparently construed for a prolonged dormancy. Steeping in acidulated or weakly alkalined distilled water (pH 5 to 5.5 and 8 to 8.5 respectively) for a short period helped soften the exospore and hastened their germination to over 90%. Mature chlamydospores developed in the current season also yielded a high germination percentage when similarly pretreated.

Pretreated chlamydospores, prior to bursting their exospores, were transferred to sterile moist filter paper strips stuck inside the cover of a petri plate and inverted

over potato-dextrose-agar medium as suggested by TUBAKI⁴. The plates were incubated at room temperature. The spores germinated, ejecting their contents over the agar substrate, which developed into small colonies. Isolated colonies were transferred to potato-dextrose-agar slants. They appeared like glistening bacterial colonies externally, consisting of unicellular budding spores. Two types of cultures could be differentiated by their pigmentation. One of them was dull, creamy white, and the other bright, deep salmon-red in colour.

Several lots of month-old host seedlings were inoculated by spraying separately with the two culture types and retained in moist chambers for 48 h. Typical galls developed on the inoculated stems in about 2 weeks in both cases. Further work is in progress.

Zusammenfassung. Die Keimruhe der Chlamydosporen von *Protomyces macrosporus* Unger, welcher auf *Coriandrum sativum* L. Stamm-Gallen erzeugt, kann durch künstliches Aufweichen der Exospore gebrochen werden. Der Pilz ist auf Kartoffel-Dextrose-Agar kultivierbar.

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¹ C. POPTA, *Flora* 86, 1 (1899).

² G. VON BUEREN, *Mycol. Centralbl.* 3, 12 (1913).

³ E. J. BUTLER, *Fungi and Disease in Plants* (Thacker Spink & Co., Calcutta 1918), p. 547.

⁴ K. TUBAKI, *Mycologia* 49, 44 (1957).

⁵ M. J. THIRUMALACHAR and M. S. PAVGI, *Indian Phytopath.* 3, 177 (1950).

⁶ M. J. THIRUMALACHAR and M. J. NARASIMHAN, *Mycologia* 45, 461 (1953).