Pak. J. Bot., 3 (1 & 2): 79—82.

STUDIES ON THE NUTRITION OF FUNGI

VI. EFFECT OF DIFFERENT COMBINATIONS OF MONO, DI AND TRISACCHARIDES ON THE GROWTH OF SOME FUNGI.

S. SHAHID HUSAIN and (MISS) KHADIJA ZAMIR

Botany Section, PCSIR Laboratories, Karachi-39.

Abstract

Studies were carried out to determine the combined effect of certain mono, di and trisaccharides on the growth of five fungi in liquid culture. Of the seven sugars used, galactose, fructose, maltose and sucrose appeared to be more effective in various combinations in supporting the growth of *Aspergillus nidulans, Curvularia verruculosa, Helminthosporium nodulosum, Paecilomyces varioti* and *Phaeoramularia* sp. Raffinose, lactose and xylose, in various combinations supported the growth of the fungi fairly well but the response of the fungi with respect to growth seemed to be more on the first four mentioned sugars.

No one combination was able to support the maximum growth of all the fungi; a point which indicates the specificity of fungi towards different sugars or combination of sugars as to their utilization.

Introduction

The multidimensional studies on carbon nutrition, its presence or absence and corresponding changes in the growth of organisms have opened new avenues in fungus physiology. All fungi are unable to utilize exactly the same source of carbon, their utilization depends on the configuration of carbon compound and the ability of a certain fungus to utilize a specific source of carbon. During studies on the nutrition of fungi, the difference in the utilization of carbon and nitrogen from different sources by different fungi has been reported (Husain et al, 1967; Husain & Zamir, 1967; Hassan & Husain, 1968; Zamir & Husain, 1969, 1970). The present investigation was carried out to determine the effect of twelve combinations of mono, di and trisaccharides on the growth of five fungi.

Meterials and Methods

Czapek Dox liquid medium was used to determine the combined effect of different mono, di and trisaccharides on the growth of test fungi. Galactose, fructose, maltose, sucrose, lactose, raffinose and xylose in combinations of galactose + raffinose, galactose + sucrose, galactose + maltose, galactose + lactose, fructose + maltose, fructose + raffinose, fructose + lactose, fructose + sucrose, xylose + lactose, xylose + maltose, xylose + raffinose, xylose + sucrose were used. Two per cent carbon concentration was kept for each sugar. Fifty ml of medium in 250 ml Erlenmeyer flasks were autoclaved at 15 lb/in ^{2} for 15 min. The flasks were inoculated with 4 mm discs cut from the growing edges of 4 days old Czapek Dox agar cultures of *Aspergillus nidulans* (Eidam) Wint., *Curvularia verruculosa* Tandon et Bilgrami, *Helminthosporium nodulosum* (Berk. et Curt) Sacc., *Paecilomyces varioti* Bain., and *Phaeoramularia* sp. These fungi were previously isolated from Karachi soils. Dry weight of the fungal mycelium was determined after 10 days incubation at room temperature (25-28°C).

Table I. Effect of twelve combinations of mono, di and trisaccharides on the growth of *Aspergillus nidulans*, *Curvularia verruculosa*, *Helminthosporium nodulosum*, *Paecilomyces varioti* and *Phaeoramularia* sp.

Carbon source	*Aspergillus nidulans*	*Curvularia verruculosa*	*Helmintho-sporium nodulosum*	*Paecilomyces varioti*	*Phaeoram-mularia sp.*
	Test Organism				
1	2	3	4	5	6
	Dry Weight (mg)*				
fructose + maltose	552	773	665	461	441
fructose + raffinose	531	827	462	430	420
fructose + lactose	529	711	544	346	407
fructose + sucrose	521	877	730	393	471
galactose + raffinose	496	403	700	441	440
galactose + sucrose	261	691	680	500	627
galactose + maltose	123	504	907	499	475
galactose + lactose	122	583	586	293	366
xylose + lactose	196	303	250	251	352
xylose + maltose	184	433	617	342	412
xylose + raffinose	169	620	631	320	388
xylose + sucrose	143	515	598	378	346

*Data based on average of 3 replicates.

Results and Discussion

The results are summarized in Table 1. Best response of *Aspergillus nidulans* was observed on a combination of fructose + maltose where the fungus produced 552 mg of mycelial mat. Galactose + lactose on the contrary did not stimulate the growth of the fungus to that extent and produced only 122 mg of mycelial mat which incidentally was the least amount of growth among all the combinations of sugars used for this fungus.

Fructose + sucrose yielded 877 mg of *Curvularia verruculosa* mycelium which was maximum among twelve combinations of sugars used. Xylose + lactose on the contrary produced 303 mg of mycelial mat being the least growth of this fungus on any combination used. Combination of galactose + maltose proved to be the best source for the growth of *Helminthosporium nodulosum* where 907 mg of mycelial mat was produced. Growth of the fungus on other combinations was also high except on xylose + lactose where the yield was 250 mg. Maximum growth of *Paecilomyces varioti* was obtained on a combination of galactose + sucrose (500 mg) and galactose + maltose (499 mg), the least on xylose + lactose (251 mg). Similarly the combination of galactose + sucrose also produced maximum growth of *Phaeoramularia* sp. (627 mg) while xylose + sucrose yielded less growth (346 mg) as compared to other combinations used.

Results of this investigations indicate that there was no combination which supported the growth of all the organisms equally well. It may be observed that galactose + maltose, fructose + sucrose, galactose + sucrose, fructose + maltose and galactose + sucrose supported best growth of *Helminthosporium nodulosum*, *Curvularia verruculosa*, *Phaeoramularia sp.*, *Aspergillus nidulans* and *Paecilomyces varioti* respectively. It may be noted that out of a total of 7 sugars supporting and best growth of the five test fungi, four sugars i.e. the monosaccharides galactose and fructose and the two disaccharides maltose and sucsose were common in the four combinations mentioned above. It is difficult to give a definite explanation as to why the above four sugars in various combinations were supporting best growth of the organisms unless a comprehensive study is carried out. There appears to be a certain amount of specificity of the test fungi towards these combinations of sugars. The ready availability of the monosaccharides galactose and fructose in the culture medium where they were used in combination with disaccharides maltose and sucrose may also be one of the factors for good growth of the fungi. Waters, Lilly and Barnett (1954) have shown that sucrose is utilized by *Sordaria fimicola* as long as any fructose remains in the medium. This probably may help to understand the better utilization of this combination by certain fungi used in these studies.

The combination of xylose + lactose apparently did not support growth of the organisms so well as the other combinations. Rest of the combinations were of intermediate order in supporting the growth of the fungi. A thorough investigation will be taken up to determine the extent of utilization of different combinations of sugars by these fungi.

Acknowledgement

The authors wish to record their sincere thanks to the Director, Karachi Laboratories, Pakistan Council of Scientific and Industrial Research for providing the facilities for this investigation.

References

Hasan, S. A. and S.S. Husain. 1968. Studies on the nutrition of fungi. III. A comparative study of nutrition requirements of some member of moniliaceae and dematiaceae. Pak. J. Sci. Ind. Res., **11**: 196–207.

Husain, S.S., S. A. Hasan and K. Zamir. 1967. Studies on the nutrition of fungi. I. Effect of various carbon and nitrogen sources and concentrations on the growth of *Fusarium dimerum* Penzig. Pak. J. Sci. Ind. Res., **10**: 127–132.

Husain, S.S. and K. Zamir, 1967. Studies on the nutrition of fungi. II. Effect of various carbon and nitrogen concentrations and sources on the growth of *Helminthosporium anomalum* Gilman & Abbot. Sci. & Ind., **3**: 196-207.

Waters, B. M., V. G. Lilly., and H. L. Barnett. 1954. The influence of galactose and other sugars on the utilization of sucrose by *Sordaria fimicola*. Proc. West Virginia Acad. Sci., **25**: 23-26.

Zamir, K. and S.S. Husain. 1970. Studies on the nutrition of fungi. IV. Effect of different nitrogen and carbon sources on the growth on six imperfect fungi. Sci. & Ind. 7: 171–176.

Zamir, K. and S.S. Husain. 1969. Studies on the nutrition of fungi. V. Effect of various combinations of monosaccharides on the growth of five different fungi. Pak. J. Sci. Ind. Res., **12**: 83—85.