International Journal of Multidisciplinary Research and Development

Volume: 2, Issue: 5, 306-308
May 2015
www.allsubjectjournal.com
e-ISSN: 2349-4182
p-ISSN: 2349-5979
Impact Factor: 3.762

Ibrahim. M
Department of Biology,Shehu Shagari College of Education, Sokoto

Shehu. K
Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto

Correspondence:
Ibrahim. M
Department of Biology,Shehu Shagari College of Education, Sokoto

Effects of Various Carbohydrates on the Growth of *Rhizopus stolonifer*

Ibrahim. M, Shehu. K

Abstract
The growth of *Rhizopus stolonifer* on different carbon sources was investigated. The carbon sources used include starch, sucrose, glucose, fructose and maltose. The fungus grew well on original Czapek-Dox agar medium as well as that with substituted carbon sources. Among the carbon sources used glucose supported the best growth. The Growth in starch and sucrose also proved to be favourable and least growth was observed in fructose and maltose.

Keywords: Effect, carbohydrates, growth, *Rhizopus stolonifer*

1. Introduction
Rhizopus stolonifer is a species of worldwide distribution and found in all kinds of mouldy materials. It can also grow on animal dung, wet shoes, rotten fruits, decaying vegetables, shed flowers and other organic materials. It is colourless, spread very rapidly completely filling tubes and dishes. *Rhizopus stolonifer* can be easily grown in the laboratory in a piece of moist bread kept under bell jar in warm place for 3 to 4 days.
Carbohydrates are substances used in biosynthesis and energy release and serve as cardinal impetus towards the viability, survival and sustenance of any organism [1]. Carbon is skeletal element for all organisms [2]. The findings of [3] and [4] have shown that glucose and maltose supported best growth of *Pycularia grisea* and *Colletotrichm musae*. Similar works were reported by [5] that glucose supported the best growth *Rhizoctonia solani* followed by maltose and sucrose. The least growth of the fungus was obtained in glycerine. Likewise, [6] recorded good growth of *Colletotrichum gloeosporioides* on starch and xylulose. This indicated that no carbon source is equally suitable for the growth of all fungi.

2. Materials and Methods
2.1 Source of fungal isolate
The isolate (*Rhizopus stolonifer*) required for this research was collected from the stocked cultures of mycology laboratory of Usmanu Danfodiyo University, Sokoto. Czapek-Dox agar medium (CDA) was used for growth studies of the isolate.

2.2 Effect of carbon sources on growth
Czapek-Dox agar media containing different carbon sources were used. The carbon sources used include glucose, fructose, maltose, sucrose and starch. The carbon sources were substituted for sucrose in original Czapek-Dox agar medium.
2mm agar discs of the actively growing culture of *R. stolonife*r were placed on CDA plates and incubated at 28°C for 4 days. Three replicate plates were harvested daily per carbon source. The mycelium is freed from agar by briefly autoclaving the cultures, filtered off the mycelium mats and washed with hot water. It was then dried to a constant weight at 80°C. After drying the mycelium was weighed on a balance. The average mean value of the mycelium mats represents the amount of growth.

2.3 Statistical analysis
The data obtained was analyzed using x^2 distribution analysis at 0.05 % level of significance.

3. Results and Discussion
The carbon sources used include glucose, fructose, maltose, sucrose and starch. Glucose, sucrose and starch supported the best growth. While fructose and maltose yielded the least growth. The result is shown in the table 1.

Rhizopus stolonifer made better growth on glucose, sucrose and starch while fructose and maltose produced the least growth. This is similar to the findings of [7] and [8] who showed that starch and fructose supported best growth of *Aspergillus niger and A. terreus*.. This result is in akin with the results of other researchers that glucose supported the best growth of *Tricholeme terreus, Rhizoctonia solani, Morchella hybrida, Ustilago esculenta, Aspergillus niger, A. flavus and A. nudilans* [5,9,10,11]. Similarly, [12] and [13] obtained the highest growth of *Fusarium oxysporum* and *Pycularia grisea* when glucose was used as carbon source. It was also reported that sucrose and starch recorded good growth of *Colletotrichum gloeosprioides, Trichoderma viride, Termitomyces striatus, Alternaria zinniae* and *Butryodiplodia theobromae* [14,15,16]. Likewise, [17] recorded the best mycelial growth of *Tetrachaetum elegans, T. marchilianum, Pestalotiopsis submersus* and *Flagellaspora penicillioides* in glucose and sucrose while [18] obtained the best growth of *Beauveria bassiana* and *Trichoderma viride* in fructose and dextrose repectively. Studies conducted by [19] showed that fructose and sucrose were the best carbon sources for growth of *Pestalotia psidii.*

The good growth obtained in glucose indicated that the fungus possessed the necessary growth factors for assimilation of glucose or the pathogen have the ability to form adaptive enzymes. The configuration of the glucose molecule also favoured good growth of *R. stolonifer*. The ability of the fungus to utilized sucrose and starch was due to the possession of relevant enzymes for the hydrolysis of sucrose and starch into their component sugars. On the other hand, it could also be due to the ability of the fungus to utilize the hydrolytic products of these sugars.

The poor growth noticed in fructose could be due to the absence of specific growth factors for the utilization of this sugar or failure to produce adaptive enzymes. This failure could also be attributed to the structural arrangement of the fructose molecule. The failure of *R. stolonifer* to produce good growth in maltose was due to the lack of necessary hydrolytic enzymes and structural arrangement of the molecule.

It is a clear evidence that *R. stolonifer* occurs on a wide varieties of organic food materials such as bread, fruits and vegetables causing enormous loss. The result of this study signifies that the carbohydrate contents of these organic materials play an important role in facilitating the destructive effects of this fungus. Thus it becomes integral to regulate the chemical compositions of organic materials found to be infected by this fungus. This will in no small measure help in minimizing the destructive effect of *R. stolonifer*. Conclusively, efforts will be geared in future towards exposing other nutritional requirements of this fungus.

4. Table

Table1: Effect of different carbon sources on the growth of *R. stolonifer*

Days	Starch	Sucrose	Glucose	Fructose	Maltose	Total
1	0.030mg	0.032mg	0.050mg	0.020mg	0.026mg	0.158
2	0.043mg	0.053mg	0.061 mg	0.024rng	0.028mg	0.229
3	0.066mg	0.099mg	0.110mg	0.030mg	0.031mg	0.336
4	0.100mg	0.110mg	0.115mg	0.032mg	0.034mg	0.391
Total	0.239	0.294	0.356	0.160	0.119	1.114

$X^2 = 0.188$, df = 12, ($P<0.05$)

5. References

1. Uzuma, M. and Gurvinda, K. (2009). Effect of carbon and nitrogen sources and ratio on germination, growth and sporulation of *Metarrhiziun anisopliae* and *Beauveria bassiana* isolates. African *Journal of Agricultural Research* 3(10): 922-920
2. Safari, S.A., Faruq, A. S., Aziz, R. P., Ali, R. B. and Tariq, M. B. (2007). Effect of nutrition on growth and virulence of entomopathogenic fungus *Beauveria bassiana Fems. Microbiology Letters* 250(28):201 – 207
3. Tripathi, SK. Effect of media, pH, nitrogen, carbon sources and light on the growth sporulation of *Pycularia grisea*. *Annals of Plant Protection Sciences*, 2006; 2(9): 41-44
4. Yang, Y. E., Tang, G., Haang, Y., Liu, M., Huang, S., Yang,Y., Tang, G. Y., Huang, Y. Y., Liu, M. Z.,and Huang, M.S. (2000). Biological chatacterization of *Colletotrichum musae* from banana fruitsin Hainam province. *Phytopathologican sinica* 30 (4): 337-342
5. Pallavi, P. and Purshotam, K. Effect of carbon and nitrogen sources on the growth of *Rhizoctonia solani* isolated from *Rhynchostylis retusa Blume. International Journal of life Sciences*, 1912, I(2): 16-18
6. Deshmukh, AJ., Mehtar, BP. Salbapara, AN., Patil, VA. In vitro effect of various nitrogen, carbon and pH regimes on the growth and sporulation of Colletotrichum gloesporioides Penz and Sacc causing anthracnose of Indian bean, *Biopest*, 2012, 5 : 46-49
7. Suleiman, M. N. And Akaejime, D. (2010). Isolation and physiological studies of fungus associated with rice grains (Oryzae sativum) in Makurdi, Benue state, Nigeria. *Free Library*
8. Zhihua, J., Xiaoli, Z.and Xuejun, C. (2009). Effect of carbon sources on fungal morphology and lovastatin biosynthesis by submerged cultivation of *Aspergillus terreus* . *Asian Journal of Chemical Engneering* 4: 672-677
9. Saha, A., Mandal, P., Dasgupta, S. and Saha, D. (2008). Influence of culture media and enviromental factors on mycelial growth and sporulation of *Lasiodiplodia theobromae* (Pat) Griffon and Maubl. *Journal of Environmental Biology*, 29(3): 401- 410
10. Kibar, B. and Peksen, A. (2011). Nutritional and environmental requirements for vegetative growth of edible mycorrhizal mushroom Tricholema terrean. Zemdirbyste – Agriculture 98(4):409 – 414
11. Jalander, V. and Gachender, B. D. (2011). Effect of carbon and nitrogen sources on growth of rhizosphere fungi of pigeon pea (*Cajanus cajan* L. Mill). *Bioinfloret*, 8 (2): 187-189
12. Farooq, S., Iqbal, M., Abdulrauf, CH. Physiological studies of *Fusarium oxysporum f. sp. Ciceri. International of Agriculture and Biology*, 2005; 7(2): 275- 277
13. Netam, RH., Bahadur, AN., Tiwari, RKS., Tiwari, U. Effect of different culture media , carbon sources, nitrogen sources, temperature and pH levels on the

growth and sporulation of *Pycularia grisea* isolate from finger millet, *Research Journal Agricultural Sciences*, 2013, 4(1): 83-86

14. Jash, S., Dutta, S., Bandyopadyay, S., and Laba. S. K. .(2003). Effect of nitrogen sources, different culture media, pH and carbon sources on growth and sporulation of *Alternaria zinniae* pope causing leaf and flower blight of marygold. *Env. Ecol*. 21: 321-325
15. Kaur, S. (2011). Effect of carbon, nitrogen and trace elements on growth and sporulation of Termitomyces striatus (Beeli) Heim. *Journal of Yeast and Fungal Research*, 2 (9): 127-131
16. Arotupin, D. J. and Ogunmola, F. E. (2012). Experimental investigation on the effect of carbon and nitrogen sources concomitant amalyse and polygakacturonase production by *Trichoderma viride* BITRS 1001 in submerged fermentation. *Biotechnology Research International*, 904763: 1-8
17. Sati, S. C. and Bisht, S. D. (2006). Utilization of variuos carbon sources for the growth of waterborne conidial fungi. *Mycologia* , 2 (3): 324-328
18. Jitendra, M., Madhulika, J., Sudha, C., Jisham, M., Dilip, S., Paman, K., Priyanka, G. and Meenu, M. N. (2012). Impact of carbon and nitrogen sources on *Trichoderma viride* (biofungicide) and *Beauveria bassiana* (entomopathogenic fungus). *European Journal of Experimental Biology* 2 (6): 2061—2067
19. Younis, M., Khalid, M., Rasshid, A., Adnan, A. Effect of carbon, nitrogen sources and ascorbic acid on the colony growth and acervulus production o *Pestaoltia psidii*, *International Journal of Agriculture and Biology*, 2004, 6(6): 1110-1112