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Effect of sporocarp maturity on chemical composition of substrate colonized by *Lentinus subnudus* Berk

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ABSTRACT: Change brought on chemical composition of substrate colonized by Lentinusu subnudus Berk the developing sporocarps were investigated. The colonized substrate was assayed for its proximate constituents at five fruitbody developmental stages of spawn run, primordial, young, mature and over mature and the mature the proximate analyses were for moisture, dry matter, ash, ethanol-soluble sugars, protein, total lipid and crude fibre.

Decreases in crude fibre, total lipids and protein contents of substrate were observed from spawn run to over-mature stage. In contrast, dry matter and ash contents increased from spawn run to over-mature stage.

In contrast dry matter and ash contents increased from spawn to run to over-mature stage. With respect to substrate sugar content, these were found to increase from spawn run to mature stage and thereafter decreased at the over-mature stage. The significance of these findings and their comparison with results of past of past workers are presented.

Key words: Sporrocarp maturity, chemical composition, substrate, *Lentinus subnudus*.

Introduction

Lentinus subnudus Berk is a saprophyte which growns in mature on decaying logs of *Spondias mombin* L. in the course of *L. subnudus* sporocarp morphogenesis and development from primordia into mature fruitbodies, biochemical changes occur in the substrate which nourishes the mushroom. These changes, which include alterations in enzymatic activities and chemical composition of colonized substrate are the effects of enzymes secreted into substrate by the saprophytic mushroom. These biochemical changes have been documented for edible mushrooms like *Agaricus bisporus* (wood and fermor 1981), *Volvariella valvacea* (Kwan & Chang 1981). *Pleurtorus ostreatus, Lentinus edodes* and *Agrocybe aegerita* (Jablously 1981). However, in the case of *Lentinus subnudus*, the extracellular enzyme activities assayed for during fruitbody morphogenesis and development (kadiri 199900. The present study was undertaken to assess changes in chemical composition of substrate colonized by *L. subnudus* during sporocarp morphogenesis and development.

Materials and Methods

Fruitbody cultivation and samples' collection:

The unfermented substrate employed for sporocarp cultivation consisted of water-soaked shreded rice straw (86%) + rice bran (10%) + $CaSO_4$ (45) (kadiri 1999b). Three kilograms of the unfermented substrate were packed into polypropylene bag, autoclaved at 121°c for 30min and spawned at 5% level under a sterile condition with planting spawn of rice straw and rice bran (kadiri 1999a0. The treatment was replicated 35 times and the polypropylene bags incubated at $30 + 2^0$ c and relative humidity of 60 – 755 for 6 weeks. Subsequently, the polypropylene bags were transferred into a fruiting chamber (temp. 28 ± 2°C, rel. hum. 70-85%) and the bags opened in order to ensure adequate aeration. Spray watering was done whenever is necessary. Primordial formation was observed one and a half weeks later.

Samples were removed from the fructification substrate at the following stages: spawn run (mycelium stage before primordial formation), primodia stage (no pileus), young stage (pileus 2.5 – 3.5cm), mature stage (4-8cm), and over-mature stage repeated six times in six different polypropylene bags for each of the stage described above and all samples dried at 100^0C for 12 days.

The dried samples were powdered separately in a blender, sieved through a 250mg sieve, the residue were reground and resieved and the final powdered samples were utilized for the following proximate analyses. Ash: Three grams of powdered samples were ashed in Gallen kemp furnace in previously ignited and cooled crucible of known weight at 55^0 c for 6h. Thereafter, the crucibles were cooled, stored in a desiccator and later weighed (Parent & Thoen 1977), osborne & vougt 1978).

Moisture contents: the loss in weight after oven-drying weighed fresh samples at $100^{0+\text{ for}}$ 2 days was taken as the moisture content (Campell& Stothern1968).

Ethanol-soluble sugars

One gram of powdered sample was extracted for 6 hours in a soxhlet extractor with 30ml boiling 80% entanol and the extract diluted to 100ml boiling 80%ethanol. The quantity of ethanol soluble sugars in 1ml of the extract was determined using the phenolosulphuric acid method of Dobois *et al* (1956).

Protein

Five hundred milligrams of powdered sample were extracted with 50ml of 2% Nalco in a water-bath at 60°C for h. The saline extract was filtered and 50ml of 3% copper acetate monohydrate were added to the filtrate to precipitate proteins (osborne & vougt 1979). The precipitated proteins were centrifuged out and dissolved in 50ml of 0.11 Noah. The quantity of protein in the alkaline solution was estimated using folin-phenol method of Lowry et at (1951), with case in as the standard protein.

Total lipid

The total lipid content was determined using the soxhlet extraction method of Mukiibi (1973) and Parent & Thoen (1977). Two grams of powdered samples were extaracted with boiling 30ml petroleum ether in a soxhlet extractor for 4 hours. The extract was evaporated to dryness in a weighed flask using a vacum evaporator. After drying the weighed flask at 89^0 for 2 hours, the flask was cooled in a desiccator and reweighed. The difference between the initial and final weights was taken as the lipid content of the sample. Crude fibre: content was determined using one gram of dettated powdered sample and the following the A.O.A.C. method of 1980.

Result and Discussion

In general, crudefibre, total lipids and protein contents of substrate colonized by l. subnudus showed persistent decrease from spawn run to over-mature stage (Table1).
These results are in conformity with those of Wakaman and Mc Grath (1973) and wood and Fermor (1981) who worked on *Agaricu bisporus* and *A. campstris* and obtain decreasing lipid and protein contents from spawn run to mature stage.

Dry matter and ash contents consistently increased from spawn run to over-mature stage (table1). These findings are in agreement with the result of earlier workers such as wakaman and Mc Grath 91973), wood and Fermor (1981) and Kwan and Chang (1981) and who worked on *A. bisporus. A. campestris* and *V. volvacea* respectively.

With respect to sugar contents, increase were observed from spawn run to mature stage and thereafter there was a decrease at the over-mature stage (table1). This could be because at the over-mature fruitbody stage, substrate nutrients could have been seriously depleted. The implication of the findings in the present study is that as the fritbody mature, crudefibre, lipid and protein are degraded into simlpier metalobites and this might also explain the increase in sugar content from spawn run to mature stage. These simple metabolites are eventually metabolized into ash and this could be responsible for the increase in ash content with sporcarp maturity.
The significance of the present study is that as the mushroom sporocarp matures, substrate nirients are constantly being depleted and commitact production of ash occurs.

Table 1: Proximate analyses of substrate colonized by *L. subnudus* at different fructification stages. Data are means of 6 replicates calculated was % dry weight except A and B that were calculated as % fresh weight.

Fructification Stage	Moisture Content (A)	Dry matter content (B)	Ash	Ethanol Soluble Sugars	Protein	Total Lipids	Crude Fibre
Spawn run	67.5	22.5	12.6	3.6	5.1	3.6	30.5
Primordial	70.6	29.4	15.4	4.7	4.6	2.7	26.7
Young	67.6	32.4	17.7	5.2	4.2	2.0	23.5
Mature	64.4	35.6	20.5	5.8	3.4	1.6	21.8
Over-mature	61.6	38.4	22.8	2.3	1.8	1.4	15.2
LSD (5%)	7.1	3.9	2.1	0.6	0.5	0.3	3.1

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References

A.O.A.C. (1980). Association. of Official. Analytical Chemists. The Official Methods of Analysis, Washington D.C.
Campbell, D.J., S. Stothers, M. Vaisey & B. Berk. 1968. Gamma irradiation influence on the storage and Nutrition Quality of Mushrooms. J. Fd. Sci. & 33: 540 – 542.
Dubois, M., A. K Gilles, K.J. Hamilton, A.D., Robers and F. Smith (1956). Colorimetric method for determination of sugars and related substances. Anal. Chem. 28: 350 – 354.
Jablonski, J. (1981). Changes in Biochemical and physiological activities of subsrates colonized by fungi, *P. ostreatus*, L.edodes and
Kadiri, M. (1999a). Production of grain mother and planting spawns of *Lentinus subnudus* Berk. Nigerian J. Botany (In press)
Kadiri, M. (1999b). Cultivation of *Lentinus suarrosulus* on uncomposted substrate in Nigeria. Global Journal of Pure & Applied Science 5: 41 – 44.

Kadiri, M. 1999c. Changes in intracellular and extracellular enzymes activities of *Lentinus subnudus* durind sporophore morphogenesi. Bioscience Research Communication 11: 127 – 130.

Kwan, H.S. & S.I. Chang. 1981. Biochemical studies of cotton wastecompostduring the cultivation of *Volvariella volvacea* Mushroom Sci. x1: 585 – 594.

Lowry, O. H.; N. Rosebrough, L.A. Farr R. Randall. 195. Protein measurement with folin-phenol reagent. J.Biol. Chem. 193: 265 – 275.

Mukiibi, J. 1973. The nutritive value of some Ugenda mushrooms, Act. Hortcult. 33: 173 – 176.

Osborne, R. D.& P. Vougt, 1978. The analysis of nutrients in Foods. In: Food science and Tech. – A series of monographs. Academic press, London, p. 113 – 116.

Parent G. & D. Thoen 1977. Food value of edible mushrooms from Upper Shaba region. Econ.Bot. 31: 436 – 445.

Waksman, S.A. & J. M McGrath 1973. Preliminary study of chemical processes involved in the decomposition of manure by *Agarius Compestris.* Amr.J. Bot. 18: 573 – 581.

Wood, D.A.& T. R. Fermor 1981. Nutrition of *Agaricus busporus* in Compost. Mushroom Sci. x1: 67 – 71.