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Effect of NPK Treatment of Cultivation Substrate on Production of *Calocybe indica*

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Abstract

Paddy straw, used for the cultivation of milky mushroom (*Calocybe indica*), was soaked in water containing N (urea), P (super phosphate) and K (muriate of potash) at 0.1, 0.2 and 0.3 % concentrations separately to study their effect on sporophore yield. It was found that none of the treatments had any significant effect on mushroom yield and control. N at 0.3% induced complete failure of the crop. N in the form slow-releasing encapsulated urea was suggested for taking care of the N-deficient paddy straw for higher mushroom yield.

Key words : NPK, Milky mushroom, Substrate, Yield, *Calocybe indica.*

Substrate is one of the most important parameters in mushroom production as mushrooms depend on substrate which is normally a source of lingo-cellulosic materials to support growth, development and fruiting (1). Cereal straws are abundant and the quantity is likely to increase in the future because of the urging need to produce more cereal grains for human consumption. Among the cereal straw, paddy straw is the most suitable basal material used for cultivation of the milky mushroom, *Calocybe indica* (2,3). Rice straw contains approximately 37% cellulose, 24% hemicelluloses and 14% lignin. Paddy straw is nitrogen poor. Adding different supplements to paddy straw can provide differing amounts of nitrogen and other nutrients to the mushrooms. As the relevant literature is meager on *C. indica* excepting few (4), a study was made to determine the effect of supplementation of paddy straw with NPK on the sporophore production of the fungus.

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Methods

N, P and K were added at 0.1, 0.2 and 0.3% concentrations separately into the water tanks used for soaking the paddy straw for mushroom cultivation. N, P and K were used in the form of urea, single super phosphate and muriate of potash, respectively. Cultivation of milky mushroom was carried out in cylindrical polythene bags (60 cm × 40cm, 100 gauges) with multi-layer spawning using wheat grain based spawn (5). Each of the treatments was replicated thrice. Matured fruiting bodies were harvested from two flushes just before flattening. Fresh weights of mushrooms along with other yield attributes were recorded. Biological efficiency of the mushroom was calculated following Royse and Bahler (6). Data on yield were analyzed statistically.

Results and Discussion

Table 1 indicates that the NPK treatments of cultivation substrate did not have much beneficial effect on mushroom yield. N at 0.1% marginally decreased the yield over control while at higher concentrations it proved to be more toxic. Paddy straw treated with 0.3% N did not support any fruiting body as there was quick rotting and disintegration of substrates which favored the growth of various weed fungi particularly species of *Coprinus*. P and K at 0.1% showed marginal but insignificant increased in mushroom yield but at higher dosage (0.3%) there were significant reductions in mushroom yield. Purkayastha and Nayak (4) were of the opinion that *C. indica* preferred P and K but not N. They have observed re-

Table 1. Effect of NPK treatment of paddy straw on production of *Calocybe indica*. Each of the observation was the average of three determinations.

NPK	Dose (%)	Sporophore no.	Yield (g)	Av wt of sporophore (g)	Biological efficiency (%)
Nitrogen	0.1	5	694.6	138.9	69.4
	0.2	2	275.3	137.6	27.5
	0.3	–	–	–	–
Phosphoros	0.1	5	715.3	143.0	71.5
	0.2	5	697.3	139.4	69.7
	0.3	4	599.3	149.8	59.9
Potash	0.1	5	704.0	140.8	70.4
	0.2	5	698.0	139.6	69.8
	0.3	4	580.0	145.0	58.0
Control	–	6	700.0	116.6	70.0
CD (0.05)			51.15		

duced yields of this mushroom at higher nitrogen levels. Edwards (7, 8) reported increased yield of edible mushrooms in response to super phosphate. A reduced yield of oyster mushroom in N-supplemented substrate has been reported (9, 10). Omoanhge et al. (11) found that NPK fertilizer supplementation of sawdust substrate did not improve the biological effciency of *Pleurotus tuber-regium.* It was inferred from the study that supplementation with NPK did not increased the biological efficiency of the fungus. It is known that the white rot fungi generally degrade lignin to obtain nitrogen for their physiological requirement and Fenn and Kirk (12) concluded that basidiomycetes degrade lignin only in nitrogenstarved conditions.

The reduction in mushroom yield in response to N in the form of urea could be explained in another perspective. Cultivation of *C. indica* was followed in cylindrical polybags where substrate supplementation was done at the timeof spawning and before filling in to the bags. It was difficult to supplement the substrate once it was completely colonized with the mycelia. In any supplementation, the bacterial and other microflora residing in the substrate was also fed and their growth was stimulated. Quick multiplication of the substrate micro flora might have resulted in a rise of inside temperature. As a result the mushroom mycelia got killed resulting in partial or complete loss of the crop. As the cropping period of milky mushroom last for nearly two months, the delayed or slow release of N in the form of any encapsulated urea could possibly manage this problem which would allow the mycelium of the edible fungus to fully colonize the substrate by the time the N was available to the contaminants.

References

1. Miles P. G. and Chang S. T. 2004. *Mushrooms : Cultivation, nutritive value, medicinal effect and environmental Impact.* 2nd edition. CRC Press, New York, USA.
2. Krishnamoorthy A.S. and M. Muthusamy. 1997. Yield performance of *Calocybe indica* (P & C) on different substrates. *Mush. Res*. 6 : 29—32.
3. Pani B. K. 2010. Evaluation of some substrates for cultivation of white summer mushroom (*Calocybe indica*). *Res. J. Agric. Sci.* 1 : 357—359.
4. Purkayastha R. P. and D. Nayak. 1981. Development of cultivation methods and analysis of proteins of a promising edible mushroom, *Calocybe indica*. *Mush. Sci.* 11 : 697—713.
5. Pani B. K. and S. R. Das. 1998. Seasonal productivity of summer white mushroom (*Calocybe indica* P. & C.) in Orissa. *Sci. Cult.* 64 : 177—178.
6. Royse D. J. and C. C. Bahler. 1986. Effects of genotype, spawn run time, and substrate formulation on biological efficiency of Shiitake. *Appl. Env. Microbiol.* 52 : 1425—1427.
7. Edwards R. L. 1949. *Mushroom research station at Yaxley. Nature* 163 : 337.
8. Edwards R. L. 1950. Some factors affecting fructification in the mushroom. *Mush. Sci.* 11 : 37—39.
9. Rawal P. P. 1979. *Studies on the factors affecting growth and sporophore formation in Pleurotus* spp. Ph. D. thesis, Univ. Udaipur, India.
10. Zadrazil F. and H. Brunnert. 1981. Investigation of physical parameters important for the state fermentation of straw by white rot fungi. *Euopean J. Appl. Microbiol. Biotech*. 11: 183—188.
11. Omoanghe S. Isikhuemhen and John A. Ookhuoya. 1996. Cultivation of *Pleurotus tuber-regium* (Fr.) Singer for production of edible sclerotia on agricultural wastes. *In Mushroom biology and mushroom products.* Penn. State Univ., USA.
12. Fenn. P. and T. K. Kirk. 1981. Relationship of nitrogen to the onset and suppression of lignolytic activity and secondary metabolism in *Phanerochaete chrysosporium. Arch. Microbiol* 130 : 59—65.