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EFFECT OF MOULD ON BIOLOGICAL EFFICIENCY OF *GANODERMA LUCIDUM* (LEYSS. EX FR. KARST)

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ABSTRACT

In Haryana condition, studies carried on cultivation of *G. lucidum* during 2013 and 2014, a combination of wheat straw + saw dust (1:1), having a 20% dosage of wheat bran as supplement and amended with calcium sulphate (3%) and calcium carbonate (1%), was filled in polypropylene bags, plugged, sterilized and inoculated with wheat grains based spawn @ 3%. The bags were placed in mushroom house at 30±1˚C with 90±1% relative humidity. During cultivation mould incidence was less in supplemented substrate (10.00%) as compare to un-supplemented (14.00%) substrate for two consecutive years and which resulted in lower down the biological efficiency from 27.52% to 20.18% respectively.

KEYWORDS: *Ganoderma Lucidum*, Substrates, Mould, Biological Efficiency

INTRODUCTION

Ganoderma lucidum is a basidiomycetous fungus that grows on dec aying logs and tree stumps. *G. lucidum* is a mushroom of medicinal importance and all parts of this mushroom namely spore, mycelium and fruiting body are used in pharmaceuticals. The basidiocarp of *G. lucidum* is a popular remedy to treat various human ailments such as chronic bronchitis, hepatitis, hypertension, arthritis, gastritis, tumour growth, diabetes; immunological disorder etc. (Ling Zhu *et al*., 2007). In India, it is also called by different names like "*Jarh Phorh*" while in Haryana; it is popularly called as "*Satpatra*" and "*Hirdo*". It is also known as Lingzhi in Chinese; Reishi, Mannentake, or Sachitake in Japanese; and Youngzi in Korean. *G. lucidum* is an annual and in wild it does not grow more than once a year like some polypores, its fruiting body is quite tough and can last for month. It has been added to the American Herbal Pharmacopoeia and Therapeutic Compendium (Perumal, 2009).

Current world production of *G. lucidum* is more than 6000 tonnes, half of which comes from China; whereas, world trade in this mushroom is approx. 1.5 billion US$, and about Rs.120 crores per annum in India (Geetha *et al*., 2012). *G. lucidum* cultivation is still low in India, where 1.2 million tonnes of mushrooms are produced annually and most of the cultivation is seasonal. Selection of a mushroom species for cultivation depends on the appropriate availability of raw materials required for the species and the suitability of environmental conditions and majority of the mushrooms are being cultivated on agro-residues like sawdust/ wood chips/ crop residues. In India, these raw materials are available in plenty and the country produces about 600 million tonnes of crop residues per year and the conditions are quite congenial for cultivation of medicinal mushrooms. Singh *et al*., (2007) reported that wheat straw, saw dust and their combination supported maximum mycelium growth of *G. lucidum*. The cultivation of *G. lucidum* follows a typical fruiting behaviour and in the beginning its stem is red and cap is yellow with white margin and the growth continues with colour of the pileus turning brownish red. Margin of the pileus stop growing after attaining the size of 4-7 cm but red colouration continues and

mature fruit body shows brownish red colouration with no white margin (Rai, 2003). The growth, spore release and spore germination in *G. lucidum* occur over a wide range of conditions. This versatility of fungus may explain the ubiquitous occurrence through a wide range of climates from various states in India. Therefore, keeping in mind, the increasing demand for medicinal mushrooms, especially of *G. lucidum*, the present work was undertaken to examine the responsible factor due to which biological efficiency was reduced using different agro-residues under natural conditions.

MATERIALS AND METHODS

The mixture of wheat straw + saw dust (1:1) supplemented with 20% wheat bran, was used for *G. lucidum* cultivation and without supplementation served as control. The substrate was soaked in water for 10 hrs and after draining excess water, it was amended with calcium sulphate (3%) and calcium carbonate (1%). The wheat bran @ 20% was added as supplement. This was filled in polypropylene bags (500 g/bag) and plugged with non-absorbent cotton and sterilized at 22 psi for 2 hrs. After cooling the bags were inoculated with wheat grains based spawn @ 3% (dry weight bases) and placed in mushroom house. The temperature in mushroom house varied from 30±1˚C during the cultivation process and humidity was maintained by regularly spraying water in the mushroom house. The mature fruit bodies were harvested and the harvesting index was that, when margin of the pileus stopped growing after attaining the size of 4-6 cm and mature fruit bodies were brownish red with no white margin. The observations were recorded for mould/disease incidence. The biological efficiency was calculated by using following formula and the data were analyzed statistically.

$$\text{BE (\%)} = \frac{\text{Yield of fruit body}}{\text{Weight of substrate}} \times 100$$

The experimental design was a completely randomized design with five replications for each treatment.

RESULTS AND DISCUSSION

The cultivation of *G. lucidum* was carried out during August-October, 2013 and February-April, 2014 under natural conditions, wheat straw + saw dust (1:1) as substrate with 20% wheat bran. The cultivation method has been derived under head of material and method. The data recorded during 2013 and 2014, was pooled and statistically analyzed (Table 1& Figure 1). The observations were recorded that the mould incidence was less in supplemented substrate (10.00 %) as compare to un-supplemented one (14.00%). Similarly the biological efficiency was also lower down from 27.52% (supplemented substrate) to 20.18% (substrate alone). The independent sample t-test applied for analysis of equality of two populations (during 2013 and 2014) means and no significant difference was observed regarding mould disease incidence. From pooled analysis of substrates and supplement on mould disease incidence and biological efficiency of *G. lucidum* during 2013 and 2014; it can be concluded that biological efficiency was also lower down from 27.52% to 20.18% due to mould incidence and variations in environmental conditions during both seasons. Similarly, Veena and Pandey (2011) also reported enormous potential of cereal straw for cultivation of *G. lucidum* in combination with saw dust and cereal bran as supplement. The present work was in agreement with Azizi *et al.*, (2012), who obtained higher biological efficiency when substrate was supplemented with wheat bran with no mould disease incidence.

SUMMARY AND CONCLUSION

During cultivation mould incidence was less in supplemented substrate (10.00%) as compare to un-supplemented (14.00%) substrate for two consecutive years and which resulted in lower down the biological efficiency from 27.52% to 20.18% respectively. During cultivation of *G. lucidum*, the supplementation played a positive role which resulted in fastest mycelial growth and reduced the effect of mould incidence from 14.00% to 10.00% by providing essential nutrients to the crop.

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APPENDICES

Table 1: Effect of Mould Incidence on Biological Efficiency of *G. Lucidum* *

Sr. No.	Substrates	Biological Efficiency (%)	Mould (Disease) Incidence (%)
1.	Wheat straw + saw dust	20.18	14.00
2.	Wheat straw + saw dust + Wheat bran @ 20 %	27.52	10.00
3.	t-value	18.90	0.67
4.	Sig. (p=0.05)	0.00	0.52

*Analysis of pooled data of *G. lucidum* for 2013 and 2014

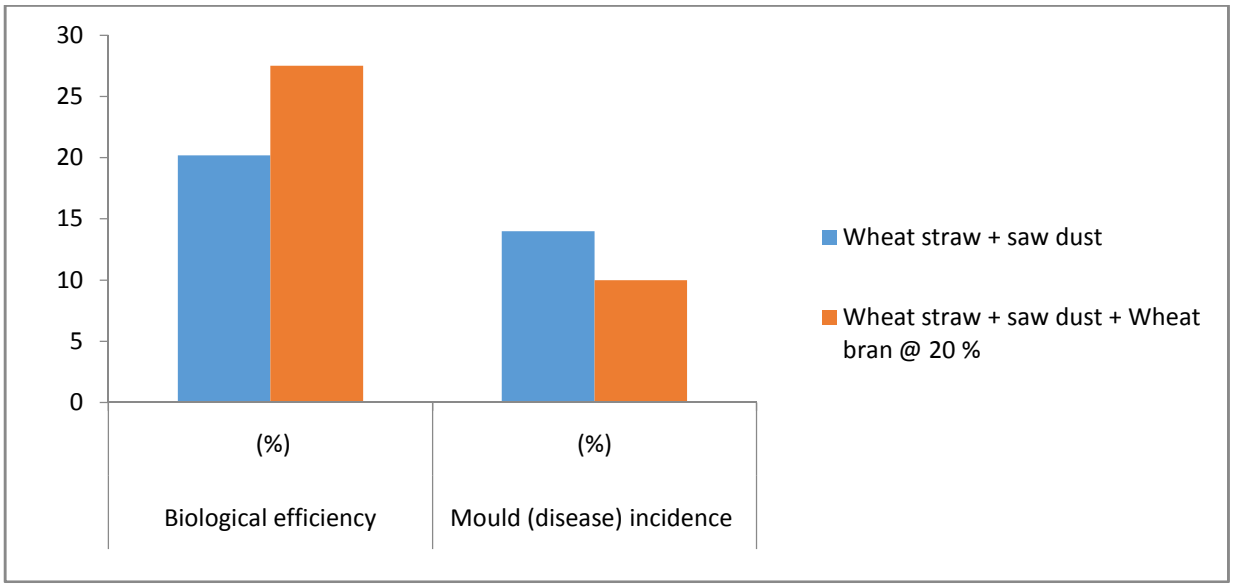

Figure 1: Effect of Supplemented Substrate on Mould Incidence and Biological Efficiency of *G. Lucidum*