Supplementary value of single cell protein from *Myrothecium verrucaria* to wheat protein

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Abstract. Corn cobs, an agricultural waste material, were used as carbon source for single cell protein (SCP) by cellulolytic fungus *Myrothecium verrucaria*. The biomass comprised of protein 28.1%; moisture 5.75%; fat 2.3%; phosphorus 0.88% and ash 7.42%. The amino acid provisional scoring pattern of biomass showed deficiency in sulphur containing amino acid methionine. Feeding trials on rats with biomass revealed that its supplementation to wheat flour at 30% level improved the growth rate and protein efficiency ratio (PER) as compared to wheat flour alone. Incorporation of DL-methionine to 30% SCP diet further improved the growth rate and PER values in rats.

Keywords. Single cell protein; fungal biomass; *Myrothecium verrucaria*.

1. Introduction

The potential importance of microorganisms as protein sources for monogastric animals and in human nutrition has been adequately discussed by several workers (Han 1975; Han et al 1976). The cellulose which forms a major part of corn cobs was successfully converted into fungal biomass by Singh and Kalra (1978). The nontoxicity of *Myrothecium verrucaria*, the biomass of which has been employed in the present study, has already been established in this laboratory (Gupta et al 1977). Ballamy (1975), Gupta et al (1977) and Shaklady (1972) reported that fungal biomass had low concentration of sulphur containing amino acids. In the present study an attempt has been made to supplement the *M. verrucaria* biomass grown on corn cobs with methionine and feeding trials were conducted on albino rats.

2. Materials and methods

*Myrothecium verrucaria* was procured from the culture collection of the Department of Microbiology, Punjab Agricultural University, Ludhiana. The culture was maintained by monthly transfers on glucose yeast extract agar medium and was stored at low temperature (4-5° C) for further use.
The corn cobs were dried at 60°C in an oven and ground to 60 mesh size in Willey Mill. Powdered corn cobs were employed as cheap carbon source in the Chahal and Gray medium (1969). The growth conditions maintained were already reported by Singh et al (1978). The growth was harvested and the biomass was dried at 60°C till constant weight was recorded. The crude fat and fibre of the biomass were determined by the standard method of AOAC (1965), whereas crude protein was estimated by the method of McKanzie and Wallace (1954).

The amino acid profile of the fungal protein in the biomass was determined in a Beckman Model 116 amino acid analyser after hydrolysing the biomass with 6 N HCl at 110°C for 22 hr.

Feeding trial was conducted to study the effect of addition of DL-methionine to fungal protein on the growth rate of rats. The protein efficiency ratio (PER) and its effect on different organs of albino rats were determined. The diets were compounded according to the procedure of Chapman et al (1959). The diet D1 was control diet containing casein; diet D2, wheat flour only; diet D3, SCP replacing 30% wheat protein; diet D4, diet D3 + 0.2% DL-methionine; and diet D5, SCP replacing 60% of wheat protein. All the diets were maintained at 10% protein level with adequate amounts of vitamins and minerals.

Pure bred albino male rats (28–30 days old) were weighed individually, and randomly divided into 5 groups each containing ten rats. The rats were housed individually in wire mesh cages and kept in well-ventilated rooms.

Feed and water were provided for ad libitum consumption throughout the investigation. Individual body weight (weekly) and food consumption were recorded daily. At the end of the experiment, the rats were anaesthetised with ether and blood was collected from heart. Liver, kidneys and spleen were taken out from the rats and these organs weighed after removing tissue. The liver nitrogen was determined by the method of McKanzie and Wallace (1954). The plasma was analysed for nitrogen and haemoglobin content of blood (of individual rats) was estimated according to the procedure of Hawk et al (1954).

Statistical analysis was done by the analysis of variance.

3. Results and discussion

By the conventional (\( N \times 6.25 \)) calculations, the protein content of \( \textit{M. verrucaria} \) biomass grown on corn cobs was found to be 28.1%; fat 2.3%; moisture 5.75%; phosphorus 0.88% and ash 7.42%. The amino acid profile of fungal biomass revealed that it was adequate in most of essential amino acids, with the exception of methionine (table 1) as compared to FAO reference protein. Methionine was limiting in \( \textit{M. verrucaria} \) grown either on beet root pulp (Gupta et al 1977) or on spent grain waste (Singh et al 1978). As might be expected, the amino acid composition of the protein was very similar to that of fish meal and extracted soybean meal (Shaklady 1972). From the preliminary as well as the present report (Gupta et al 1977; Singh et al 1978) it was concluded that \( \textit{M. verrucaria} \) biomass had lesser amount of sulphur containing amino acids. To overcome this shortcoming DL-methionine was incorporated into SCP-supplemented diets.