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Effect of different combinations of sawdust and wheat straw on sporophore production of *Schizophyllum commune*

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Abstract
The experiment was conducted to investigate the effects of various combinations of sawdust and wheat straw on the production of Split Gill Mushroom (*Schizophyllum commune*). The observations were recorded for the duration of spawn run, days to first harvest, cropping period, number of fruiting bodies, stipe length (cm), pileus width (cm), yield (g/kg dry substrate) and biological efficiency. The highest yield (234.80 g/kg of dry substrate, with a biological efficiency of 23.48%) was observed when using 100% wheat straw significantly outperforming all other combinations. In contrast the lowest yield (137.40 g/kg of dry substrate with 13.47% B.E.) was recorded for the control which used 100% sawdust.

Keywords: Pileus, stipe, sawdust, spawn run

1. Introduction

Mushrooms are important not just for human use but also for the overall health of ecosystems. Mushrooms contain a range of bioactive compounds such as beta-glucans, polysaccharides, terpenoids, phenolic compounds and ergothioneine, all of these are associated with numerous health-promoting effects. (Chang and Hayes, 1978) [1]. e earlycivilizations of Greece, Egypt, Rome, China, and Mexico valued mushrooms as delicacies, were aware of their medicinal properties, and frequently included them in religious rituals (Rahmani *et al.* 2024) [5]. *Schizophyllum commune* is referred as the split gill mushroom, occupies a special place among the various species medicinal mushrooms. The term "split-gill" originates from the unique morphology of its gills, which appear split lengthwise, making it the only known species in the genus *Schizophyllum*. *Schizophyllum commune* is becoming more popular in medicine for its wide range of pharmacological actions. Schizophyllan, a β-glucan polysaccharide it generates, has antiviral, anticancer, and immunomodulatory qualities (Varnosfaderani *et al.*, 2024) [10]. The species also exhibits antibacterial, antifungal, and antiviral activities, further supporting its role in pharmaceutical research. Due to these remarkable biological traits, *Schizophyllum commune* continues to serve as an important organism in scientific research and industrial biotechnology.

2. Materials and Methods

The experiments of the present investigation were conducted in Mushroom Research Training Centre (M.R.T.C.) of Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut, U.P. which is situated on the Western side of the Delhi-Dehradun high way (NH-58) at a distance of 10.0 km away in the north of Meerut city. The pure cultures of split gill mushrooms (*Schizophyllum commune*) were obtained from the ICAR Directorate of Mushroom Research Centre, chambaghat-Solan Himachal Pradesh. These cultures were purified for use with the single hyphal tip technique. The cultures were grown on in sterilized petridish on potato dextrose agar (PDA) medium and incubated at 28+2 °C in BOD incubator for 10 days. Wheat grains were selected as the substrate material. The grains were first washed 3-4 times with clean water and soaked overnight to absorb moisture. After soaking the grains were boiled in clean water for approximately 15 minutes.

Once boiled they were spread in a thin layer on a wire mesh to drain excess water and cooled to room temperature (25±2 °C). Following cooling, the grains were mixed uniformly with 1.2% commercial-grade gypsum ($CaSO_4$) to prevent sticking and 0.3% calcium carbonate ($CaCO_3$) to stabilize the pH at approximately 6.5. The treated grains were then packed into sterile 500 ml glass bottles, filling them up to two-thirds of their capacity. Each bottle was securely plugged with non-absorbent cotton and covered with butter paper or aluminum foil. Sterilization was performed in an autoclave at 121 °C (1.1 kg/cm² pressure) for two hours over two consecutive days to ensure complete sterilization. Under aseptic conditions each sterilized bottle was inoculated with a 5 mm disc taken from a 7-day-old pure culture of *Schizophyllum commune*. The inoculated bottles were then placed in a B.O.D. incubator set at 28 °C for 10 days. For substrate sterilization high-quality wheat straw and wood sawdust are soaked in clean water in separate tanks for 14-16 hours. The substrates are then packed into polypropylene bags each weighing 1 kg, with varying ratios of wheat straw and sawdust, such as 90% wheat straw/10% sawdust, 80% wheat straw/20% sawdust, 70% wheat straw/30% sawdust, and so on.

A PVC neck (3.5 cm diameter) is inserted at the top of the bags which are tightly plugged with non-absorbent cotton and covered with butter paper. These bags are sterilized in an autoclave at 121 °C (1.1 kg/m² pressure) for 1.5 hours. The sterilized polypropylene bags were inoculated with 2% mother spawn of *Schizophyllum commune* (on a wet basis) under strict aseptic conditions in a laminar airflow cabinet. Following inoculation the bags were transferred to a dedicated spawn-running room where the temperature was controlled at 28±2 °C to support optimal fungal growth.

Upon completion of the spawn run a dense compact white mass of mycelium interwoven with the straw substrate was observed within the bags indicating successful colonization.

3. Results and discussion

The highest yield (234.80 g/kg of dry substrate, with a biological efficiency of 23.48%) was observed when using 100% wheat straw significantly outperforming all other combinations. This was followed by the combination of 90% wheat straw and 10% sawdust which yielded 211.81 g/kg of dry substrate with a biological efficiency of 21.18%. In contrast the lowest yield (137.40 g/kg of dry substrate with 13.47% B.E.) was recorded for the control which used 100% sawdust. This was followed by the combination of 10% wheat straw and 90% sawdust which yielded 146.81 g/kg of dry substrate with a biological efficiency of 14.68%. The shortest spawn run duration (9.50 days) was observed with 100% wheat straw, which was significantly similar to the combination of 90% wheat straw and 10% sawdust (10.25 days). The longest spawn run duration (12.50 days) was recorded in the control group (100% sawdust), which was statistically similar to the combination of 10% wheat straw and 90% sawdust (12.25 days).The earliest first harvest (17.00 days) occurred in the 100% wheat straw which was significantly earlier than all other combinations. On the other hand the latest first harvest (21.25 days) was observed in the control group (100% sawdust), significantly delayed compared to the rest. For the cropping period, the longest duration (29.50 days) was observed in the (100%) wheat straw treatment, which was significantly longer than all other combinations. This was followed by the combination of (90%) wheat straw and (10%) sawdust (28.25 days). The shortest cropping period (24.00 days) was observed in the control group (100% sawdust).

The highest number of fruiting bodies (75.00) was recorded in the treatment with 100% wheat straw, which was significantly greater than all other combinations. In contrast, the lowest number of fruiting bodies (64.50) was observed in the control group with 100% sawdust, which was significantly lower than the rest. Similarly the maximum stipe length (0.42 cm) was noted in the 100% wheat straw treatment, significantly exceeding that of all other treatments. The minimum stipe length (0.39 cm) was recorded in the 100% sawdust control which was significantly lower than the others. As for pileus width the widest pileus (5.58 cm) was observed in mushrooms grown on 100% wheat straw which was again significantly superior to all other treatments. The narrowest pileus (5.05 cm) was found in the control group (100% sawdust) marking the lowest performance among all combinations. These results clearly indicate that using wheat straw particularly at 100%, leads to superior morphological and yield characteristics in *Schizophyllum commune* compared to sawdust alone.

Table 1: Effect of different combination of sawdust and wheat straw on Sporophore production of *Schizophyllum commune*.

S. No.	Treatments	DFSR	DFFH	DFCP	NOFB	Stipe Length (cm)	Pileus Width (cm)	Yield g/kg Dry Substrats	Biologicl efficiency (%)
1.	Wheat Straw + Sawdust (10%)	10.25	17.75	28.25	73.00	0.40	5.43	211.81	21.18
2.	Wheat Straw + Sawdust (20%)	11.50	19.00	26.50	72.75	0.41	5.50	197.29	19.72
3.	Wheat Straw + Sawdust (30%)	11.00	19.00	26.00	68.25	0.41	5.40	184.17	18.41
4.	Wheat Straw + Sawdust (40%)	12.00	18.00	27.00	68.00	0.40	5.38	152.66	15.26
5.	Wheat Straw + Sawdust (50%)	12.25	21.25	25.00	65.75	0.42	5.45	146.81	14.68
6.	Wheat Straw	9.50	17.00	29.50	74.50	0.49	5.58	234.80	23.48
7.	Sawdust (Control)	12.50	20.25	24.00	64.50	0.39	5.05	137.40	13.74
CD at 5%		0.80	0.66	1.05	3.57	0.053	0.17	3.70	-
SE(m)		0.27	0.22	0.35	1.21	0.018	0.058	1.25	-

*Average of four replications

DFSR = Day for spawn run, DFFH = Days for first harvesting, DFCP = Days for cropping period , NOFB = Number of fruiting body

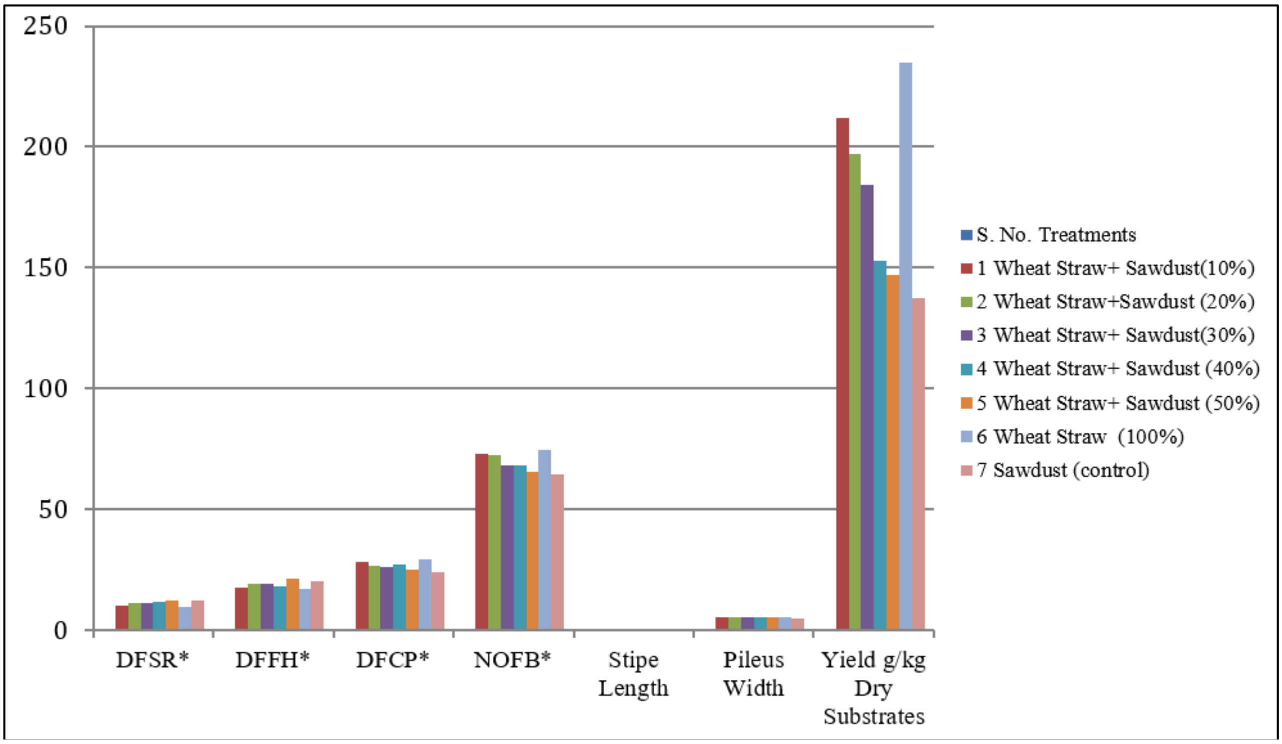

Fig 1: Effect of different combination of sawdust and wheat straw on Sporophore production of *Schizophyllum commune*

4. Conclusion

Regarding experiment on sporophore production ie the effect of different combination of sawdust and wheat straw on sporophore production of *Schizophyllum commune*. The highest yield (234.80 g/kg of dry substrate, with a biological efficiency of 23.48%) was observed when using 100% wheat straw significantly outperforming all other combinations. This was followed by the combination of 90% wheat straw and 10% sawdust which yielded 211.81 g/kg of dry substrate with a biological efficiency of 21.18%. In contrast the lowest yield (137.40 g/kg of dry substrate with 13.47% B.E.) was recorded for the control which used 100% sawdust.

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