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Research Article

Optimum conditions for culturing of *Azolla pinnata*

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Abstract

The study was conducted to optimise the environmental conditions required for culturing of *Azolla pinnata* in 24 pits (2 x 2 x 0.2 m) using different manures (cattle, sheep, poultry and pig manures) in 4 x 3 factorial design. The optimum environmental conditions were in the range of 28.94 – 33.46°C, 1413.29 – 1561.57 Lux and 47.28 – 64.85 (%) of temperature, light intensity and relative humidity respectively. Which favoured the vegetative mass yield of 3.73 kg and dry matter yield of 172 g per pit per week. Cattle, sheep, poultry manures are comparable and superior when compared to pig manure. The vegetative mass yield (kg) was significantly ($P < 0.01$) lower in *Azolla* pits used pig manure when compared with other treatments.

Keywords: *Azolla*, Optimum conditions of *Azolla*, Culturing of *Azolla*.

Introduction

India is bestowed with large livestock population. Although milk production has reached top position in the world but the productivity of livestock per unit in of our country has not been maximised. There is a deficit of 61.96 million metric tonne of green fodder and 22.08 million metric tonne of dry fodder. Hence there is a need to identify and incorporate unconventional feeding resources. In the recent past the natural resource like fern plants like *Azolla* are being used as animal feed supplements. (Dolberg *et al.*, 1981) opined that the water plants might be very useful in combinations with conventional feeds of poorer quality such as rice straw. Bauer, (1990) reported that under optimal laboratory conditions *Azolla* species had a rapid vegetative propagation with biomass doubling time of two days or less. Hadder, (1988) reported

that the optimum season for maximum growth of *Azolla* species was the summer season followed by the spring season. With the above consideration the study was conducted to standardize the optimum conditions for culturing of *Azolla pinnata* (The optimum conditions are temperature, light intensity, relative humidity). Biomass and dry matter yields of *Azolla pinnata* in different manures like cattle, sheep, poultry and pig manures also studied.

Materials and Methods

Azolla was cultivated in fodder production unit of Department of LPM, CVSc, Tirupati. *Azolla* kit supplied by Animal Husbandry Department, Chittoor, Natural Resources Development Project

Table 1. Influence of temperature (°C) on biomass and dry matter yields (kg) of *Azolla pinnata*

Week	Temperature (°C)		Biomass yield (Kg)									
	Maximum	Minimum	Vegetative mass yield (Kg)				Mean ± SE	Dry matter yield (Kg)				Mean ± SE
			C ₁	C ₂	C ₃	C ₄		C ₁	C ₂	C ₃	C ₄	
I - VIII	33.46±0.61	28.94±0.1 9	4.44±0.07 ^a	3.96±0.04 ^b	3.89±0.05 ^b	2.61±0.03 ^c	3.73±0.096	0.18±0.003	0.18±0.002	0.18±0.003	0.14±0.002	0.17±0.004

Table 2. Influence of light intensity (Lux) on biomass and dry matter yields (kg) of *Azolla pinnata*

Week	Light intensity (Lux)	Biomass yield (Kg)									
		Vegetative mass yield (Kg)				Mean ± SE	Dry matter yield (Kg)				Mean ± SE
		C ₁	C ₂	C ₃	C ₄		C ₁	C ₂	C ₃	C ₄	
I-VIII	1463±23.88	4.44 ± 0.07 ^a	3.96 ± 0.04 ^b	3.89±0.05 ^b	2.61±0.03 ^c	3.73±0.096	0.18±0.003	0.18±0.002	0.18±0.003	0.14±0.002	0.17±0.004

Table 3. Influence of relative humidity (%) on biomass and dry matter yields (kg) of *Azolla pinnata*

Week	Relative humidity (%)	Biomass yield (Kg)									
		Vegetative mass yield (Kg)				Mean ± SE	Dry matter yield (Kg)				Mean ± SE
		C ₁	C ₂	C ₃	C ₄		C ₁	C ₂	C ₃	C ₄	
I - VIII	55.07 ± 1.91	4.44 ± 0.07 ^a	3.96 ± 0.04 ^b	3.89±0.05 ^b	2.61±0.03 ^c	3.73±0.096	0.18±0.003	0.18±0.002	0.18±0.003	0.14±0.002	0.17±0.004

(NARDEP) an organ of Vivekananda Kendra in Kanyakumari, Tamilnadu suggested a simple technique with some modifications for culturing of Azolla. 24 pits (2 x 2 x 0.2 m) using different manures (cattle, sheep, poultry and pig manure) in 4 x 3 factorial design. Silpaline sheet is used to cover the pit and taken 10 kg fertile sieved soil and added 4 kg of different manures in 10 lit of water. Water level maintained at 10 cm. 500 gm of Azolla culture inoculated and the pit was covered with nets to prevent spoilage due to fallen leaves. Azolla was rapidly grown and filled the pit within 7 days about 500-600 q of Azolla harvested daily.

Results and Discussion

The Influence of temperature ($^{\circ}\text{C}$) on biomass yield (kg) at weekly intervals are shown in table 1. The mean maximum temperature was 33.46°C and mean minimum temperature was 28.94°C during 8 weeks of experimental period. which were in accordance with (Singh, 1977). The influence of light intensity (%) on biomass yield at weekly intervals are shown in table 2. The mean light intensity (Lux) was 1463. These results are correlated with the reports (James, 1998; Lumpkin *et al.*, 1980). The influence of relative humidity (%) on biomass yield observed during 8 weeks of experimental period shown in table 3. The mean relative humidity (%) was 55.07. Similar results obtained (Becking, 1979; Costa *et al.*, 1996).

The mean vegetative mass yield (Kg) in c_1 , (Cattle), c_2 (sheep), c_3 (Poultry) and c_4 (Pig) were 4.44, 3.96, 3.89 and 2.61. The vegetative mass yield higher in cattle manure when compared to sheep, poultry and Pig manures. In Pig manure poor vegetative mass yield were seen. The biomass yields of cattle, sheep, poultry manures were comparable and pig manure inferior when compared to other manures. The poor performance of pig manure was also reported by (Costa *et al.*, 1996).

Based on the study concluded that the optimum conditions for culturing of Azolla are the maximum temperature 34.86°C , minimum temperature 28.78°C , humidity (%) 56.07, light intensity (Lux) 1487.43. Manures suitable are cattle, sheep and poultry manures.

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