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Influence of Seed Soaking Duration on Biomass Yield of Barley (*Hordeum vulgure*) Green Fodder Produced through Hydroponics Technology

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Abstract

An experiment was conducted to evaluate the optimum seed soaking duration for production of Barley (*Hordeum vulgure*) green fodder through hydroponics technology. Six treatments of seed soaking duration in tap water with three replications were studied. In each treatment 35 Kg of RD-2552 variety of Barley seeds were used for green fodder production through Hydroponics machine. After 7 days of period three components namely average height (mm), average production (kg) and biomass conversion of biomass yield of Barley hydroponics green fodder were studied. Out of these six treatment groups, 12 hrs of seed soaking duration for production of Barley nutritive green fodder through hydroponics technology showed best result in two components namely average production and biomass conversion.

Key words : *soaking duration, biomass conversion, hydroponics, Barley.*

Introduction

Green fodder is staple food for animals and It has direct effect on performance of the animals. Green forage has cooling effect on animal body, more palatable, contain easily digestible nutrient and slightly laxative, when effectively utilized in natural form. Round the year green fodder production is highly essential for economical and sustainable dairy farming. The major limitations in production of green fodder by farmers are unavailability of land for fodder cultivation due to small land holding size, scarcity of water and more labour required for cultivation of green fodder etc. (1, 2). India has the largest livestock population 536 million (31 percent of the world) with milk production growth rate of 10 percent year on year basis. The nation's milk production increased at CAGR of 6.2 percent from 146.31 million tonnes in 2014-15 to 209.96 million tonnes in 2020-21(3). The current feed and fodder resources in India can meet only less than 50% of the requirement of its livestock population. The increase in livestock population along with the intensive rearing system has resulted in the increase demands for feed and fodder in country. The feed scarcity has been the main imitating factor in improving the livestock production. The land allocation for cultivation of green fodder is limited to only 4-5% of the cropped area (4), but by 2030, India would require a total 671 and 1207 million tons of dry fodder and green fodder respectively (5). Green fodder constitutes 13 to 35% of total input cost, out of total feed cost is about 70 to 75% of the total expenditure is on a dairy farm. National Dairy Development Board recommends that a cow which is milching 8 to 10 liters of milk per day be fed 25 to 30 kg of green fodder, 4 to 5 Kg of concentrate per day during lactation. To resolve livestock's nutrient deficiency, supplementation of dry roughages with hydroponic nutritive green fodder is also a practical approach for improving roughages utilization. This technology can easily adopt to achieve nutritional rich green fodder with higher yield in shorter period of time as compare to conventional practices of green fodder production throughout the year (6). Growing of green fodder by seeds without soil with tap water or nutrients rich solutions is known as hydroponics green fodder. It is mostly produced in green houses under controlled environmental condition. The introduction of sprout fodder for animals using hydroponics had been recognized as early as 1930. In late 1980s, attempts were made in India for propagating hydroponics technology for forage production and research works were under taken by several workers (7, 8, 9, 10). Water plays an important role in seed germination. It helps by providing necessary hydration for the vital activities of protoplast, provides dissolved oxygen for the growing embryo, softening of the seed coats and increases the seed permeability. It also helps in the rupturing of seed and also converts the insoluble stored food into soluble form in seed for translocation to the embryo. Seed soaking duration affects the yield of the hydroponics fodder. Therefore, the present study was aimed to find out the optimum duration of seed soaking for high production of fresh hydroponics green fodder particularly in the arid area of Rajasthan.

Materials and Methods

This study was undertaken at Rajasthan University of Veterinary & Animal Science, Bikaner. Hydroponics barley fodder was produced in a hydroponics machine equipped with automatic controlled system of irrigation, temperature (18-20°C) and humidity (80-90% RH). Barley (*Hordeum*

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Table-1 : Component's biomass yield of Barley green fodder through hydroponics Technology at different Seed Soaking duration.

Treatment	Seed Soaking Duration (Hrs)	Average Height (mm)	Average Production (Kg)	Biomass Conversion
T_1	4	195	185.99	5.306
T_2	8	185	187.64	5.361
T_3	12	175	190.99	5.457
T_4	16	165	162.65	4.647
T_5	20	155	161.93	4.627
T_6	24	155	160.23	4.578
CD (0.05)		11.84	5.13	0.15

vulgare) seeds of RD-2552 variety were used in this trial. Six treatments of seed soaking duration were applied in three replications and three components i.e. average height (mm), average production (kg) and biomass conversion of Hydroponics green fodder biomass yield were studied. In this trial, barley seed input quantity of 35 Kg was used in each treatment. Clean seeds of this crop were soaked in tap water in different duration i.e. 4, 8, 12, 16, 20 and 24 hrs and designated as T_1, T_2, T_3, T_4, T_5 and T_6, respectively and were kept in gunny bags tightly for germination for 36 hrs. The germinated seeds were evenly placed in the trays and kept in hydroponics machine on day first. Trays were shifted manually on next day to next level from day 1 to 3. Subsequently from day 4th, trays were on the rollers and pushed to next level with every passing day. Inside the growth chamber, the seeds were allowed to grow for 7 days and then on eighth day, three components of Biomass yield were evaluated namely average height (mm), average production (Kg) and biomass conversion*. This green fodder was harvested on 8th day and fed to the animals. Biomass conversion was calculated by using following formula.

$$\text{*Biomass conversion} = \frac{\text{Production of hydroponics green fodder}}{\text{Seed input Quantity}}$$

Results and Discussion

Components of hydroponics green fodder biomass yield were evaluated on 8th day which is the end of the production period in hydroponics machine. In this study, all the components of biomass yield showed in different magnitude. Average production data in T_1, T_2, T_3, T_4, T_5 and T_6 in treatment groups were 185.99, 187.64, 190.99, 162.65, 161.9 and 160.23 kg respectively. In this investigation the biomass conversion values were 5.306, 5.361, 5.457, 4.647, 4.627 and 4.578 in T_1, T_2, T_3, T_4, T_5 and T_6 treatment groups, respectively. Maximum production of hydroponics green fodder was observed in T_3 group, where whole seed was soaked for 12 hrs duration. The result showed that soaking of seeds and the rapid uptake of water for facilitating the metabolism and utilization of reserve materials of the seeds for growth and development of the plants is a very important step for production of hydroponics forage. (11, 12, 13) also studied that the forage seed alfalfa (*Medicago sativa*), barley (*Hordium vulgare*), cowpea (*Vigana unguiculata*), sorghum (*Sorghum bicolor*) and wheat (*Triticum aestivum*) were washed well from residues of bleach and re-soaked in tap water overnight (about12 hrs) for green fodder production under hydroponic technique. (14, 15, 16) also suggested that clean seeds of barley (*Hordium vulgare* L.) were washed and soaked in tap water for 12 hrs and then put in gunny bag for 24-36 hrs till root emerged. Many researchers reported that Seed soaking duration affects the yield of the hydroponics fodder which varies with the type of seeds.

Conclusions

Findings of present experiments showed that 4 to 12 hrs of soaking duration give best result (Morgan *et al.,* 1992, Ghazi N. Al-Karaki, 2011 and W. Gebremedin, 2015). Out of these six treatments 12 hrs of seed soaking duration for production of Barley green fodder through hydroponics technology showed best result in two components namely average production and biomass conversion (Table-1). From the present data results, it may be concluded that seed soaking duration 12 hrs was found optimum and has to play very important role in Barley green fodder production through hydroponics technology.

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