RICE STRAW AND STRAW EXTRACTS ON GERMINATION AND SEEDLINGS OF *Oryza sativa* AND *Echinochloa crus-galli*

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Weeds cause significant damage to rice by reducing the quality and quantity of crop yield and increasing the cost of production[1]. *Soil incorporation or surface application of crop residue mulches, affects weed dynamics by reducing/delaying seed germination and suppressing plant density and vigour of the weed community[2]. A* greater inhibition of grassy weeds and Barnyard grass (*E. crus-galli* in particular under open field condition was recorded due to application of rice straw mulch in lowland rice. *E. crus-galli*, is found primarily in direct-seeded rice and is the most frequent lowland paddy weed in many parts of the world, including Sri Lanka[3]. The management of *E. crusgalli* in lowland rice cultivation is crucial to attain optimal rice yields. If suppression of germination of *E. crusgalli* through release of allelochemicals or by physical barrier of rice straw is possible; it may provide a perspective to reduce the reliance upon herbicides. This study evaluated the effect of rice straw and rice straw extracts on germination and seedling growth of rice and barnyard grass in the laboratory.

The experiments were conducted in the Plant Sciences laboratory at the Faculty of Agriculture of Rajarata University of Sri Lanka. Ground rice straw was examined for physical barrier effect on growth and development of *rice,* Bg 352 *(dry and soaked)* and barnyard grass seeds. Twenty seeds of each species were placed in separate Petri dishes (10.0 cm in diameter) containing a filter paper in each (Whatman no. 1). Thereafter, 2.5 g (the amount was equivalent to 4t/ ha rate) of ground rice straw was placed over the seeds and moistened using 5 ml of distilled water and placed at room temperature (29 °C). The dishes were watered with 2 ml of distilled water at two day intervals. In control treatments the *rice (dry and soaked)* and *barnyard grass* seeds were placed in Petri dishes without rice straw and same quantity and application interval of distilled water as in straw treatment.

The rice straw extract was prepared by using ground rice straw (2.5 g) soaked in distilled water (50 ml) for 24 hours and shaked for 48 hours at room temperature. The solutions were filtered through 4 layers of Whatmans No. 1 filter paper. Twenty surface sterilized seeds of either dry paddy seeds or soaked paddy seeds or barnyard grass seeds were placed in separate Petri dishes lined with a Whatman filter paper No. 1. The filter paper was moistened with 5 ml of rice straw extract concentrations (i.e. 25, 50, 75 and 100%) and with distilled water in the control treatment. Data on germination percentage, root, shoot elongation (cm) and their biomass were recorded after 14 days after seeding. The experiments were conducted in a completely randomized design with three replicates. Analysis of variance was carried out and Duncan's test was used for means at the 0.05 probability level.

Dry rice seeds, soaked rice seeds and barnyard grass seeds exhibited 95 %, 95 % and 73% germination respectively when rice straw was not applied. In contrast, the application of rice straw significantly reduced the germination of dry paddy seeds by 21% ($P < 0.01$). and germination was not affected, when rice seeds soaked for 24 hours. Application of rice straw significantly reduced the germination of barnyard grass (40 %) compared to the control (73 %). The difference in germination between the control and rice straw treated barnyard grass seeds was significant ($P < 0.01$). Rice straw application reduced the root length and shoot length significantly by 16 % and 20 % in dry rice seeds and 16% and 19% in barnyard *grass* seeds. However, the root and shoot lengths were not affected significantly when the rice seeds were soaked.

The root and shoot biomass of dry rice seeds, soaked rice seeds and *barnyard grass* seeds were significantly reduced due to rice straw application (Table 1). Rice straw extracts at different concentration showed no significant effect on germination of all three types of seeds. A significant reduction of root length in control treatment, was observed compared to extract concentrations of 25 %, 50 %, 75% and 100 %. Highest root length at concentrations of 75 % and 100% in all three types of seeds was observed. Similarly, the shoot length also increased with the increased rice straw extracts concentrations.

Although, the shoot length was not significant in *barnyard grass* seeds at different concentrations of rice straw extract, higher values were recorded in 25 %, 50 % and 75 % extract concentrations. The root and shoot biomass was significantly affected only in dry rice seeds by different concentrations. The lowest root and shoot biomass was recorded in control treatment. The stimulatory effect of an allelopathic chemical (low concentration of secalonic acid F) on root and stem growth of sorghum have been repotted and agrees with these results. Hence, the reduction of seed germination in barnyard grass was due to the effect of physical barrier and not to the negative effect of water soluble extracts.

Table 1: Effect of rice straw on seedling growth of rice and *E. crus-galli* seeds

Treatment	Root length (cm)	Shoot length (cm)	Root dry weight (g)	Shoot dry weight (g)
DRS	8.21 b	5.57 b	0.065 b	0.063 b
DRS+RS	6.88 c	4.43 c	0.045 c	0.043 c
SRS	10.84 a	5.53 b	0.079 a	0.078 a
SRS+RS	10.85 a	5.70 b	0.055 c	0.062 b
ES	8.20 b	6.83 a	0.017 d	0.032 d
ES+RS	6.87 c	5.5 b	0.007 e	0.018 e
CV %	7.63	8.10	11.06	7.58

DRS: dry rice seeds; SRS, soaked rice seeds; ES, Echinochloa crus-galli seeds; RS, rice straw In a column, values followed by a common letter are not significant at 5 % probability.

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