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Screening and evaluating allelopathic potential of rice (Oryza sativa L.) on barnyardgrass, the complexities between laboratory bioassay and greenhouse

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Objectives

This study was to evaluate the allelopathic potential of the selected 73 Vietnam rice varieties on barnyardgrass in both bioassay and greenhouse. The correlation among different rice cultivars and origins and the complexities between results of screening in bioassay and greenhouse were monitored and discussed.

Materials and Methods

- Plant: The selected 73 Vietnam rice varieties were classified into 6 types: traditional sticky rice, traditional sticky upland rice, local traditional rice, traditional upland rice, foreign and hybrid rice varieties, and barnyardgrass seeds were used as indicator plants.
- Laboratory screening: using seedling techniques with some modification
- Greenhouse screening: application following double pots screening method

Results and Discussion

Different rice varieties and origins showed various dissimilarities of allelopathic properties. In screening bioassay, among selected rice varieties and origins were ranked as follow: local traditional variety > local traditional sticky > hybrid >traditional sticky upland > traditional upland variety> foreign variety. Total average of inhibitory effects were arranged from 9 to 17% on germination and growth of barnyardgrass. However, screening in greenhouse showed as in order: traditional uplandvariety > hybrid >foreign > traditional sticky upland >local traditional variety >local traditional sticky. It was denoted that through a laboratory bioassay is unable to elucidate allelopathic properties of the plants with their operational in natural setting. The factors, such as selected indicator plants, climatic, edaphic, microbial ecology, nutrition dynamics, life cycle pattern, density and other abiotic and biotic should be scrutinized.

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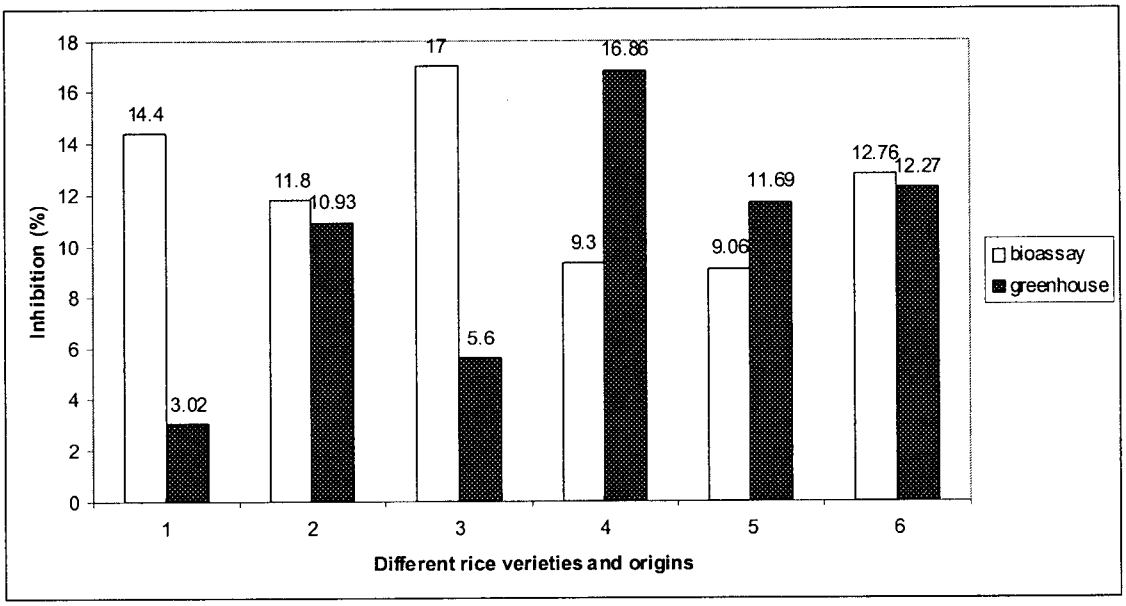
Table 1. The average of inhibitory percentage among different rice varieties and origins

Varieties and origins	Bioassay				Greenhouse		
	ASL	ARL	TADW	TA	ASL	TADW	TA
Local Traditional Sticky	15.71	22.28	5.1	14.4	2.42	3.72	3.05
Tradition Sticky-upland	7.97	17.83	9.73	11.8	8.46	13.4	10.93
Local Traditional	14	27.9	9.0	17	2.7	8.5	5.6
Traditional Upland	8.43	26.65	14.51	9.3	15.08	18.65	16.86
Foreign	7.55	16.8	2.81	9.06	10.76	12.62	11.69
Hybrid	12.1	19.81	6.4	12.76	9.64	14.9	12.27

Note: ASL: average of shoot length; ARL: average of root length; TADW: total average dry weight

Figure 1: Comparison of total average inhibitory effects of different rice varieties and origins between bioassay and greenhouse



1. Local traditional sticky rice; 2. Traditional sticky rice-upland 3. Local traditional rice 4: Traditional upland variety; 5. Foreign variety 6. Hybrid