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Impact of Weed Seed Mixture in Seed Health of Aus Rice and Factors Affecting it

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Abstract: A socio-agronomical survey and a laboratory experiment on weed seed mixture with rice seed were carried out at the three different villages of Mymensingh district and in the laboratory of Bangladesh Agricultural University, Mymensingh respectively during the period from January to June 2002 to know the farmer's knowledge and idea about the impact of weed seed mixture on the quality of rice seeds, and to know the status of seed purity in rice collected from different locations of Bangladesh. In the socio-agronomical survey, 100 farmers from six villages e.g. Kazirshimla, Dewanibari, Seedstore, Bharadoba, Churkhai and Rampur under three Upazilas namely Trishal, Bhaluka and Sadar were randomly selected for interview. Pre-prepared questionnaire were used to ask questions on different aspects of weed contamination with rice seeds. Results revealed that 90% farmers of the area cultivated IR50 and only 3% farmers grew BR2 rice variety. They got higher average yields from IR50 (1.96 t ha^{-1}) than other varieties e.g. BR2 (1.65 t ha^{-1}) and BR3 (1.75 t ha^{-1}). Farmers found five noxious weed seeds e.g. *Echinochloa crusglli, E. colonum, Cyperus iria, Scirpus spp.* and *C. difformis* in the rice seeds. *E. crusgalli* was appeared as the notorious weed to rice farmers. Forty percent of the interviewed farmers were educated up to class five and literate farmers used higher seed rate, which led to less weed infestation in the field. Eighty nine percent farmers used their own seed, which were produced and processed with care, and there was less possibility of weed seed contamination. Eight percent farmers used seeds from market, which contained more weed seeds in rice seeds. Laboratory analysis of seed samples collected from different locations of the country revealed that location has an impact on the weed seed mixture in rice seeds. Samples collected from the village more away from Bangladesh Agricultural University, Mymensingh contained more weed seeds. The purity percentage of farmers saved seed was about 95% and it contained 0.08% weed seed. The weed seeds found in the farmers saved seed samples were *E. crusgalli, E.colonum, Scirpus spp.* and *Cyperus difformis.*

Key words: Weed seed mixture, rice seed, genetic purity

Introduction

Seed may be called as the foundation of agriculture. Among the "first fives" of improved agriculture seed is always ranks as the first, which is the basic input of rice production. Without the improvement of seed quality the improved technology can hardly improve the production potential. The importance of quality rice seed in increasing yield has been widely recognized (Bhuiyan *et al*., 2002). Farmer-to-farmer exchange or own saved seed is the major source of seeds in Bangladesh. Only about 12% quality rice seeds are supplied by the government and non-government agencies to the farmer. Therefore, it is clearly evident that the great bulk of the rice seeds have to be produced by the farmers. Continuous saving of seeds from own harvest as seed without proper cleaning would seriously affect seed health leading to lower yields (Mew, 1997). Many noxious weed seeds are transmitted through farmers saved rice seed (BRRI., 2000). In order to improve the quality at farmers' level information regarding the existing production and post harvest technologies of seed crops are essential.

The physical quality refers to the composition of a particular seed lot in terms of pure seed, other crop seed, weed seed and inert matter. This property of seed can be altered by processing and reprocessing, it may also vary from place to place and farmers to farmer. It is, therefore, important to know the influence locations of farmers. With these ends in view this study was conducted to: I) know the farmer's knowledge and idea about impact of weed seed mixture in rice seeds on the quality of rice seeds, ii) to know the purity of rice seeds collected from different locations of Bangladesh.

Materials and Methods

A socio-agronomical survey was conducted during January to June 2002 in six different villages of Mymensingh district and the laboratory analysis with the seed samples collected from different villages during survey, was done at the of Department of Agronomy,

Bangladesh Agricultural University, Mymensingh using complete randomized design. One hundred farmers were interviewed from six different villages under Trishal, Bhaluka and Sadar Upazilla of Mymensingh district namely Kazirshimla and Dewanibari, Seedstore and Bhoradoba, and Churkhai and Rajpara, respectively where Aus rice were widely cultivated. Three villages namely Kazirshimla, Bhoradoba and Churkhai were purposively selected from three different Upazillas (Trishal, Bhaluka and Sadar) of Mymensingh district for collection of seed samples. Some samples were also collected from the Genetic Resources and Seed Division (GRSD) of BRRI, Gazipur. From each of the three villages, ten farmers were randomly selected. Then 1 kg of rice seed was collected from each farmer and the seeds collected from each farmer (1 kg) was mixed properly to have a representative sample and their purity was estimated in the laboratory. Finally for statistical analysis, the ten farmers (from each village) were considered as ten replications. Ten seed samples, which were collected from BRRI was also mixed properly and were considered as control.

The purity analysis was done by following the method of ISTA (1966). Working sample was then separated into four components i.e. pure seed, other crop seed, weed seed and inert matter. After separation on a seed board, each fraction was weighed up to 2 decimal digits and then it was converted into 1 kg. Data were analyzed statistically with statistical package programme of IRRISTAT 3.1 and SPSS porogram. Mean differences were adjudged using the technique of DMRT.

Results and Discussion

This survey was done to know the knowledge and idea of the farmers about the impact of weeds both in fields and in seeds on the yield and quality of rice. It was also attempted to find out the variety they usually grow in Aus season, the extent of weed mixture observed in the rice field and the species of weed seeds found in the rice seeds. Some other factors which might affect the impact of weeds in yield and quality of rice were also investigated. Data in the Table 1 showed that most of the farmers (90%) in the surveyed area cultivated IR50 variety and only 3% farmers grew BR2 in Aus season. The reason for widely adoption of IR 50 may be the special characteristics of the variety like short duration and medium size grain and the best fitting in the cropping pattern of that area. As per their reports, they get mean grain yields (1.96 t ha^{-1}) than other varieties (Table 1). The variety produced as highest yield as 3.21 t ha^{-1} under good cultural practices. Whereas other Aus varieties e.g. BR2 or BR3 produced 16%, 11% respectively less yield than IR50.

Data in Table 1 also showed that farmers found five noxious weed seeds in the rice seeds e.g. *Echinochloa crusgalli, E. colonum, Cyperus iria, Scirpus sp.* and Cyperus difformis present in IR50 seed. However, only *E. crusgalli* was found in the BR2 seed. Farmers also found *E. crusgalli* and *C. difformis* seeds were mixed with BR3 rice seeds. Therefore, *E. crusgalli* was very notorious weeds giving troubles to the rice farmers of the surveyed area which was common to all cultivated varieties. Since, it is difficult to identify at early stages, it escapes the farmers' eyes during weeding. As a result its seeds are harvested with the rice seeds. Severity of the weed species in the rice field was also studied in this survey. Data presented in the Table 2 indicated that 94% farmers reported that *E. crusgalli* was the common weed in the Aus rice field and 72% farmers expressed that this weed was very severe weed in the crop. Similarly, 75% farmers reported that *E. colonum* was the common and 21% farmers reported as very severe weed in the Aus field. *C. difformis , Cyperus rotundus, Scirpus sp.* and other were also found in the Aus fields with less severity.

Table 1: Rice varieties grown by the farmers and their impact on grain yield and weed infestation

Varieties	% Farmer	Yield t ha^{-1} Max.	Min.	Ave.	Name of weed Seeds found In rice seeds
IR-50	90	3.21	1.43	1.96	*Echinochloacrusgalli, Echinochloa colonum, Cyperus difformis, Cyperus iria, Scirpus sp.*
BR-2	3	2.96	0.25	1.65	*E. crusgalli*
BR-3	7	2.22	1.36	1.75	*E. crusgalli , C. difformis*

Max. = Maximum, Min. = Minimum, Ave. = Average

Table 2: Severity of weed species found to grow in Aus rice field as reported by the farmers

Scientific name	Local name	Family	% of total farmer Severe	Very severe
E. crusgalli	Baro Shama	Poaceae	94	72
E. colonum	Khudey Shama	Poaceae	75	21
C. difformis	Nakphully	Cyperaceae	69	27
C. rotundus	Mutha	Cyperaceae	55	9
Scirpus spp.	Chechra	Cyperaceae	49	12

In the survey the farmers were asked to provide the information about the sources of the rice seeds with a view to know whether there is any impact of seeds sources on the weed seed mixture in rice seed. Data presented in the Table 3 showed that 89% farmers used their own seed but it has been documented that the use of cleaned seed from farmers' own harvest can raise paddy yield by 8-10% in Bangladesh (Diaz *et al*., 2000) and among them 67% farmers found no weed seed in their rice seed. However, 9% farmers found large quantity of weed seeds mixed with their rice seeds.

Only 8% farmers' collected seeds from market and among them 75% farmers found small quantity of weed seeds were present in the rice seeds. Again, 3% farmers collected rice seed by exchanging from the neighbour and

Table 3: Impact of seed sources on the weed seed mixture in rice seed lot

		Severity level of weed seed		
Seed sources	% of farmer	Not present	Small quantity	Large quantity
Own	89	60	21	8
		(67%)	(24%)	(9%)
Market	8	0	6	2
		(0%)	(75%)	(25%)
BADC	0	0	0	0
		0	0	0
Neighbour	3	0	3	0
		(0)	(100)	(0)

Table 4: Impact of farmer's literacy on the use of seed rate in raising rice seedling

		Seed rate (kg ha^{-1})		
Education	% of Farmer	Farmer	BRRI*	% Difference
Illiterate	22	47	26	44.68
Class 1-5	40	52	26	50
Class 6-10	26	52	26	50
Above class 10	12	49	26	47

Source= Adhunik Dhaner Chash, Bangladesh Rice Research Institute, Gazipur

all of them found small quantity of weed seeds present in rice seed. No farmer collected seeds from BADC in the surveyed areas. Therefore, the sources of rice seeds had a significant impact on the presence of weed seeds in rice seeds. Purchasing seeds from market or exchanging seeds from neighbour both enhanced the spread of weed seeds in the rice fields through mixture with rice seeds. The level of farmers' education was another factor, which was investigated to know if there is any effect of farmers' literacy on weed seed mixture in rice seeds. Data presented in the Table 4 indicated that 22% farmers were illiterate and they used about 45% higher seed rate than that of BRRI recommendation. Farmers who were educated from class one to class ten used 50% higher than that of BRRI recommendation. Again, farmers who were educated above class ten used 47% higher seed. Therefore, literate farmers used comparatively less amount of seed than literate farmers. Use of higher seed rate lead to less weed infestation in the field. Therefore, educated farmers were more careful about the excluding weeds in the rice fields and by doing this, they eventually reduced the weed seed mixture in rice seeds.

The idea of the farmers about the possible sources of weed seeds that come to the rice field and their relative contribution in total weed infestation was also investigated in the survey. Ninety seven percent farmers reported that weed seeds come to the rice field from soil seed bank and with rice seed (Table 3).

Only 3% farmers thought that weed seeds came to the field through seed bank only. As per their suggestion the rice fields should be free from weed plants so that no seed is produced in the weed plants and come back to the soil.

The physical and biological composition of the seeds depends upon the production technology, threshing and processing. The physical composition of the seed lot includes inert matter while the biological composition constitutes pure seed, other variety seed, other crop seed and weed seed. The intensity of inert matter in a seed lot depends upon the processing while the biological composition is affected by the presence of other varieties and crops present in the crop seeds, the isolation distance and the infestation of weeds in the crop field, cleanliness of threshing floor, drying and other operations. This experiment was carried out to know whether the seed collected from the different area and location have any impact on the weed seed mixture in rice seeds. In other words to know how the physical and biological composition of rice seeds varied due to different locations. The result of laboratory analysis of collected seed samples revealed that the purity percentage of farmers' saved seed was about 95% (Table 5).

The standard for percent pure seed fixed by the Seed Certification Agency (SCA) is 96.0% (SCA, 1976) as the minimum admissible limit. Therefore, the pure seed component in the farmers saved seed was below the SCA standard. From the Table 5 it can be seen that there was significant variation between the seeds produced by the farmers of different villages. This variation in seed purity might be due to variation in their socio-economic aspects or cultivars used in their fields. It is to be noted that these data were collected from three villages only. To know the actual impact of farmers of different area on rice seed impurity data from more diversified area of the country should be collected. Presence of other varieties of the same crop also impairs the commercial value of the crop. Therefore, this component of seed sample must be carefully looked into. In the collected seed sample it was found that the farmers' seeds had no other crop seeds (Table 5). The BRRI seeds were also free from seeds of any other variety (Table 5). The reason for this freeness from the contamination of other crop seeds might be due to growing same variety by the farmers and proper roguing in the field. BRRI variety were grown with certified seeds, therefore, genetic purity was maintained in maximum limit. The weed seed component is possibly the most undesirable and destructive portion of a seed lot. Normally, the weed seeds happened to be the very minimum in size as well as lighter in weight. The standard for percent total weed seed fixed by the SCA is 0.10% to be the maximum (SCA, 1976). The farmer's seed contained 0.08% weed seed (Table 5), which is much below the national standard. Even some farmers produced seed, which were free from weed seed.

However, there was a significant difference between the data in weed seeds from different villages, which again

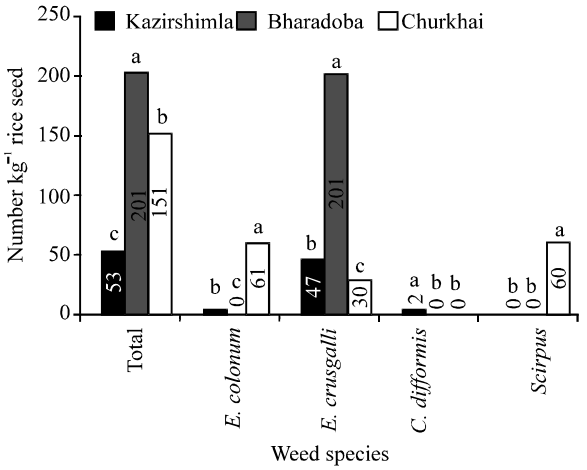

Fig. 1: Impact of locations on the number of weed seeds of a particular species

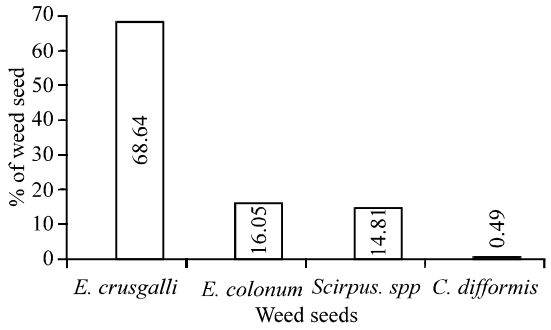

Fig. 2: Different weed seeds present in the rice seed lot collected from three villages

Table 5: Effect of area of seed collection on weed seed mixture in rice seed lot

Village	Total seed taken for test (kg)	Seed component (kg) Pure seed	Other crop seed	Weed seed Weed seed	inert matter
Kazirshimla	10	9.585a (95.85)	0	0.003b (0.03)	0.341c (3.41)
Bharadoba	10	9.34c (93.4)	0	0.011a (0.11)	0.587a (5.87)
Churkhai	10	9.447b (95.47)	0	0.001c (0.01)	0.438b (3.38)
Total	30	28.372 (95.33)	0	0.016 (0.08)	1.366 (4.59)
BRRI* (Standard)		9.95	0.0	0.0	0.05

Means followed by a common letter are not significantly different at the 5% level by DMRT *Source: Grain Resources and Seed Division of BRRI, Gazipur-1701

indicates the impact of socio-agronomical condition of the farmers of different villages on the seed impurity of rice (Fig. 1). The BRRI seeds were free from weed seeds. The species of weed seeds found in the farmers saved samples were *E. crusgalli* , *E. colonum, Scirpus spp.* and *C. difformis* (Fig. 2).

Sattar (1980) reported that *E. crusgalli* seed was present in the farmers saved seed when he was studying the impact of management and post-harvest operations on the quality of seed crop of rice. The (%) of inert matter in farmers-saved seeds was 4.55 (Table 5). The Seed Certification Agency has prescribed 4.0% inert matter as the admissible maximum limit. So the farmers' seed contained inert matter more than the maximum limit set by SCA. The inert matter was also significantly higher in seed of farmers than that of BRRI (Table 5).

Therefore, it can be concluded that the extent of weed seed mixture in rice seeds depend on the variety grown, farmer's literacy, location of seed collection, sources of seeds which must be taken into account to avoid weed seed mixture during production of rice crop. Severe infestation with *E. crusgalli* in rice field and presence of higher amount of weed seeds in rice seeds emphasize farmers to take proper control measure for the species.

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