Survey and Analysis of Rice Seed Cleaning from Several Farms in Thailand

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ABSTRACT

Two hundred and seventy rice seed samples (2.5 kgs/sample with 30 samples/province) were collected from farmers in 9 provinces; Chiang Mai and Chiang Rai representative of the North, Nakon Ratchasima and Udon Thani of the North-East, Chacheongsao, Supan Buri and Chai Nat of the Central, and Nakhon Si Thammarat and Phatthalung of the South. To assess current on-farm seed management practices in rice production, the farmers, seed owners were individually interviewed at the same visit. Results of farmer perceptions and practices had been summarized in the text. The impact evidence indicated that most of the farmers prefer to change their rice-growing varieties every 2-3 years because they could not keep a stability of rice variety quality after continuous used over 5 seasonal crops. It is noted that farmers mainly use government recommended varieties at 78.97% combine with local and traditional varieties at 11.07% and 9.96% respectively. Collected seed samples were then sent to laboratories to analyse and assess their contaminants. Among the pathogenic fungi found on seed, *Alternaria padwickii* and *Curvularia lunata* were the major contaminants which mainly observed in the Central region. Bacteria, *Xanthomonas* sp. and *Pseudomonas* sp. were also slightly found, rice seed with red pericarp *Oryzae* spp. so called "red rice" was the major contaminant commonly mixed-in a high level of 55% followed by seeds of weeds *Ishaemum rugosum, Echinochloa calona* and *E. crus-galli* at 33.35%, 21.41% and 14.97% respectively. All seed samples were below the standard seed quality for growing purpose.

INTRODUCTION

One of the national agriculture policy focuses on increasing good quality than quantity of rice production. All essential technologies to improve its quality had been integrated in the nationwide program. Using good, clean and healthy seed is a very good start to obtain a high quality yield (Mew and Misra, 1994). It is the best method with the lowest cost of investment that all farmers can afford (Wanapee, 1989). Thomson (1979) defined "Quality Seed" as pure , clean, no contaminant, vigorous, good germination with low moisture content. "Dirty panicle" is one of the most important rice diseases in Thailand (Disthaporn, 1989) caused by complex fungi such as *Curvularia lunata, Fusarium moniliforme, Helminthosporium oryzae, Salocladrium oryzae, Trichogonis padwickii, Cercospora oryzae.* Some of these are seedborne pathogens which serve as primary inoculum for disease distribution (Ou, 1972).

Regarding to the criteria of seed standard created by the Department of Agriculture, multiplication seed must contain at least 98 percentage of purity, contaminants less than 2 percent by weight, only one rice seed with red pericarp out of 1,000 g, or one false seed in 250 g, germination must be over 80% with an optimal moisture content at 14% (Prongsiriwattana, 1989). This seed management practices are hopefully implemented by the farmers. In Thailand there are many farmers in each region, so it is worthwhile to know their perceptions and practices on form seed management. This study was made to assess current on-farm seed management practices in rice production and analyse the contaminants and to assess the rice seed that farmers will use for the next cropping season.

MATERIALS AND METHODS

The study was made by using questionnaire with first draft and rewrite after. The questionnaire

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consists of twenty-two principal questions concerning to the current on-farm rice pests and seed management practices in rice production was prepared. The survey was made by individual interviewed with 270 farmer families in 9 provinces (selected 30 farmers per province) of 4 regions as followed:

North	- Chiang Mai, Chiang Rai
North-East	- Nakhon Ratchasima, Udon Thani
Central	- Chacheongsao, Supan Buri, Chai Nat
South	- Nakhon Si thammarat, Patthalung

Collection of 270 seed samples ware also made (2.5 kgs/sample) from 9 provinces (30 samples/province). Two hundred and ten samples were analyzed and assessed at Pathum Thani Rice Research Center, Pathum Thani and 60 samples were done at Phrae Rice Research Center, Phrae. At the same time, each of farmers provided his/her own 1 kilogram rice seed prepared for the next crop use for analysis.

One kilogram of rice sample was visually examined. The contaminants were classified into 5 groups as 1) empty grain, 2) plant debris, 3) soil, 4) stone, and 5) animal waste. They were then seperated, weighed, and recorded.

A 500 gram rice seed of each sample was threshed by a thresher machine. Red percicarp rice send as well as false-rice variety seed were picked out and counted.

The moisture content of the two hundred fifty grams rice seed of each sample was measured by a moisture meter.

Four hundred rice seeds of each sample were placed on wet paper at 10 seeds per row with 10 rows (100 seed/paper), then wrapped the paper and kept in chamber for 7 days. The number of germinated seed was counted and recorded.

Microorganism isolation

Four hundred seeds were randomly taken out from each sample for micro-organism isolation by Agar plate method (Mew and Misra, 1994) Twenty five seed were placed in a water agar plate with total of 16 plates. They were kept in room temperature for 5-8 days and then were examined under a compound microscope. The kind and density of microorganism were identified and recorded.

Weed seed identification

Five hundred grams rice seeds of each sample were examined in order to separate weed seed. The kind and quantity of weed seed were identified and recorded.

Duration

October 1994 - June 1995

RESULTS AND DISCUSSION

Farmer interview

The rice varieties commonly used by farmers in regions studied were summarized as follows:

North	: Niew Sanpatong, RD6, RD10, KDML105
North-East	: RD6, Niew Sanpatong, Hang-Yi71, RD10, KDML105, RD15, Leaung-Pratew, Kao-Taheang17, and SPR90
Central	: SPR90, CNT1, SP35-1, SPR-NEW, RD23, SPR60, Sarai, Peung-Sawan, Rad, KDML 105, Hin-sorn, SPR-short, SPR 33-1 and Peung-Thong.
South	: Kawin, Bang-Keow, SPR60, SPR90, Shieng, Malay, KDML 105, LEP-NOK, RD7, Pin-keow, Doctor, and RD23

It is noted that farmers mainly use government recommended varieties at 78.97% combine with local and traditional varieties at 11.07% and 9.96% respectively (Table 1).

Summary of farmers' key answers

1. Sixty six percent of farmer relied on chemical for their rice pest control measure.

2. The response to the question on the reasons why the farmers do not change to new seed/variety is that seventy two per cent preferred to old varieties because they can still produce very high yield

3. Over 67% prepared their own seed stock for the next cropping season by winnowing, sun drying, packed in sack and then stored in warehouse (common traditional practice).

4. The response to the question on how farmers select clean seed, is that most of them

Table 1. Rice varieties used by farmers in regions studied in 1994/1995.

Region	No. of total sample	No. of govern. recom. variety	No. of local variety	Other variety
North	60	60 (100%)	0	0
North-East	60	56 (93.33%)	2 (3.33%)	2 (3.33%)
Central	91	70 (76.92%)	2 (2.2%)	19 (20.88%)
South	60	28 (46.67%)	26 (43.33%)	6 (10%)
Total	271	214 (78.97%)	30 (11.07%)	27 (9.96%)

(35%) selected good looking seed by experience, some (22%) removed innert matters and empty seed by winnowing, some (20%) selected by floating method and some (6%) chose clean and good seed from the high yielding plots.

5. For the ones who do not show concern on clean seed, these are the following reasons :
   - Waste time (26%)
   - Use government recommended seed (23%)
   - Their own seed is good enough (18%)
   - Convenience to purchase from everywhere (12%)
   - Others (21%)
6. Reasons for no seed treatment:
   - No chemical (35%)
   - Do not know how to do (15%)
   - Never do this before (14%)
   - Use government recommended seed (14%)
   - No pest problem then no need (11%)
   - Not necessary, waste time and money (5%)
   - Chemical is hazardous (2%)
   - Chemical cause poor germination in seeds (1%)
   - others (3%)
7. Reasons for chemical seed treatment:
   - For seedborne pathogens control (78%)
   - For pest control (11%)
   - For rice blast control (11%)
8. Methodology on chemical seed treatments:
   - Mix seed fungicide in plastic bag and homogenize shake (73%)
   - Fungicide soaked seed (20%)
   - Fungicide dry seed treatment and storage for 1 month (7%)

Contaminant and red-rice (*Oryza* spp.) examination combine with moisture content and germination tests.

Since it was quite difficult to classify minor contaminants into 5 different groups as planned, all kinds were then combined as "contaminants" and weighed. The results showed that an average percentage of the contaminants ranged between 4.42% to 6.54% which are higher than the standard level (2% by weight), meaning all seeds collected from farmers in every regions was below the national standard. However seeds from the North, North-East and Central showed pretty good in germination (over 80 %) and low moisture content (under 14% RH) except those from the South which gave low germination rate at 59.04% and high moisture content at 16.45 (Table 2)

Regarding to the criteria of rice seed standard for growing purpose, rice seed samples in each region were analysed and compared. The results indicated

Table 2. Average percentage of contaminants, moisture content, and germination rate analysed from 270 rice seed samples in all regions.

Region	Average percentage		
	Contaminants	Moisture content	Germination
North	4.42	13.01	85.62
North-East	4.64	12.80	94.99
Central	6.42	12.02	95.44
South	6.54	16.45	59.04

that there were only 1.67% and 3.33% from the North and Central that could pass the standard level. Most of farmers' rice seeds were contaminated with red-pericorp in a very high percentage (Table 3) that caused the unstability of pure rice varieties used in the next cropping season. This is why the farmers had to change their rice growing varieties every 3-5 croppings.

Micro-organism isolation

Eleven genera of fungi were found. Six out of 11 genera: *Alternaria padwickii, Curvularia lunata, Dreschlera oryzae, Fusarium semitectum, F. moniliforme*, and *Rhizoctonia* sp. are causal agents of major rice diseases, and the latter were saprophytes.

Seed in the South carried the most fungi at average of 3.83% followed by those in the Central (2.95%), the North-East (0.58%), and the North (0.24) (Table 4). It is noted that *Alternaria padwickii* and *Curvalaria lunata* were the major pathogenic contaminants observed mainly in the Central. As saprophytic fungi, *Penicilium* sp. was mostly found in the South where rainfall and high humidity which are favorable to fungal growth are higher than the other regions. Moreover, two genera of bacteria, Xanthomonas and Pseudomonas were also slightly found in every locations (Table 4).

Weed seed identification

Seed of *Ischaemum rugosum* was mostly found in all regions with the highest at 55% in the

Table 3. Results on the analysis of farmers' rice seed base on the national standard for growing purpose.

Region	Seed under standard (%)					Seed above standard
	Contaminants (over 2%)	Moisture content (over 14% RH)	Germination (under 80%)	Red rice	False variety	
North	95.01	25	0	50	37.33	1.67
North-East	80	15	0	51.67	56.66	0
Central	95.57	6.67	1.11	39.56	-	3.33
South	98.34	83.37	48.34	78.34	-	0

Table 4. Fungi and bacteria found on rice seed collected from farmers in four regions in 1994.

Organism	Percentage of seed contaminated by organism			
	North	North-East	Central	South
Fungi				
Alternaria padwickii	0.02	2.09	15.58	6.05
Curvularia lunata	0.18	1.35	3.31	0.31
Dreschlera oryzae	0	0.02	0.01	0
Fusarium semitectum	0	0	0.02	0.01
Fusarium moniliforme	0.2	0.13	0	0
Nigrospora sp.	0.2	0.75	0	0
Phoma sp.	0.03	0.12	0	0
Bipolaris sp.	0.85	0.02	0	0
Rhizoctonia sp.	0	0	0.01	0
Aspergillus sp.	0.01	0.53	0.46	4.01
Penicilium sp.	0	0.16	1.29	8.77
Average	0.24	0.58	2.95	3.83
Bacteria				
Xanthomonas sp.	0.93	0.03	0	0.34
Pseudomonas sp.	0.84	0.03	0.83	1.58
Average	0.08	0.03	0.41	0.96

Table 5. Weed seed and red rice contaminated in farmers' rice seed in four regions in 1994.

Weed	Percentage of contaminated weed seed				Average
	North	North-East	Central	South	
Echinochloa colona	10	15	59	1.66	21.41
E. crus-galli	6.66	3.33	38.24	11.66	14.97
Ishaemum rogosum	21.66	55	45.09	11.67	33.35
Red rice (noxious seed)	50	51.67	39.56	78.34	54.89

North-East followed by Central, North and South at 45.09%, 21.66% and 11.67% respectively. *Echinochloa colona* and *E. crusgalli* were the major problem in the Central while *Oryza* spp. so-called red-rice which is considered as the noxious weed shows heavy contamination in every regions (Table 5).

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