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no.344 (1977)



Harvesting Wild Rice

Grown as a Field Crop

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Harvesting WILD RICE Grown as a Field Crop

Wild rice (*Zizania aquatica* L.) grown in Minnesota can be classed into shattering and nonshattering types. The shattering type drops seeds very readily after they mature. This type grows naturally in Minnesota lakes and rivers and was first used in seeding cultivated fields. A few nonshattering plants that held their seed beyond maturity were found in a cultivated field in 1963. Several nonshattering varieties have been developed since and now comprise the major portion of the wild rice acreage in Minnesota.

Harvesting Shattering Types

Shattering type wild rice must be harvested several times during the ripening period because seeds on each panicle mature at different times and seeds shatter at maturity.

Wild rice picking machines (figure 1) can harvest shattering wild rice several times without destroying the plants. The machine is first driven through the field when a few grains are plump and can be dislodged readily by lightly tapping the panicle. The machine harvests the field four or five times at 2-day intervals and is driven in the same wheel tracks each time. Harvesting starts in late July for wild rice grown from Minnesota seed and in early July for wild rice grown from Canadian seed. Total yields of 250 pounds per acre of green (30-40 percent moisture) grain are common with shattering wild rice.

Harvesting Nonshattering Types

Most of the cultivated acres of wild rice are planted to nonshattering types. These are harvested with rice combines modified for wild rice (figure 2). Rice combines used in Louisiana, Arkansas, Texas, and California are modified by increasing the reel diameter and putting on full tracks for better flotation in soft peat soils.

Even with the nonshattering wild rice varieties, the kernels on individual panicles ripen unevenly and some seed shattering occurs before all the kernels are ripe. This uneven ripening and shattering necessitates harvesting nonshattering wild rice before all the kernels are mature. Growers need to decide when to harvest for highest yield and best quality. To aid in this decision, nonshattering wild rice was harvested over a several week period at the North Central Experiment Station at Grand Rapids in 1973, 1974, and 1975. The Johnson variety was used in 1973 and 1974. Three varieties, M1, K2, and Johnson were used in 1975. Yield comparisons between varieties should not be made for 1975 since they were grown at different plant populations. Loss due to blackbirds was minimized in 1973 by patrolling and by plastic netting in 1974 and 1975. The results are given in tables 1 through 4.

Figure 1. Picker for harvesting shattering wild rice.

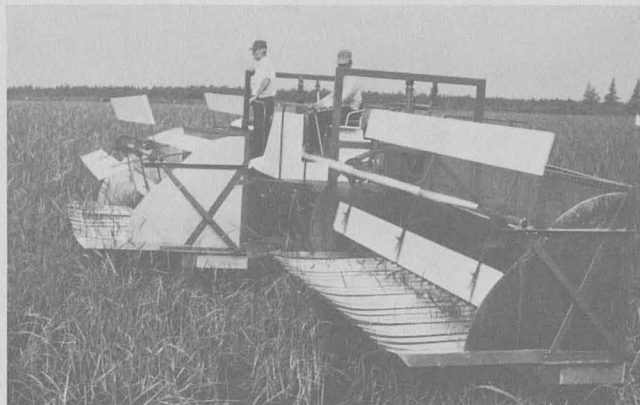


Figure 2. Rice combine modified for harvesting nonshattering wild rice by increasing the reel diameter and increasing the width and length of the track.



Table 1. Grain characteristics and yield of unprocessed and processed grain of the Johnson variety harvested on several dates during 1973 and 1974.

Harvest Date	Unprocessed green grain				Processed grain ⁵			Total processed grain ³ (pounds/A)	
	Dark kernels (percent)	Grain moisture (percent)	Grain wt. at harvest (pounds/A)	Dry wt. of grain ¹ (pounds/A)	Recovery, green wt. basis (percent)	Whole kernels (pounds/A)	Broken kernels ² (percent)		
1973									
Aug. 27	2	49	853	435	12	72	29.4	102	
29	6	46	1196	646	17	156	25.0	208	
31	8	48	1465	762	18	195	27.2	268	
Sept. 4	31	39	1552	957	36	437	22.1	561	
7	39	39	1630	999	37	479	20.3	601	
10	42	35	1308	850	44	422	26.1	570	
12	44	36	1074	687	41	353	20.5	444	
				LSD ⁶ .05	185			LSD .05	108
1974									
Aug. 29	0	54	283	130	13	23	21.6	37	
Sept. 3	3	55	457	206	17	58	15.4	78	
6	9	55	682	307	12	70	10.6	85	
9	11	52	750	360	25	145	14.9	188	
12	15	54	1136	522	19	165	12.3	211	
16	18	49	1185	604	25	242	7.2	307	
19	28	42	1213	703	30	284	12.2	368	
26 ⁴	49	39	758	462	33	193	9.9	252	
				LSD .05	153			LSD .05	104

¹Includes hulls; 2 percent moisture

²1973 values high due to handling procedure during processing

³7 percent moisture

⁴4 days after freezing temperatures

⁵The grain was processed by D.C. Lund, Food Science Department, University of Wisconsin-Madison for the years 1973 and 1974

⁶LSD (Least Significant Difference) values are statistical measures of variability within trials; If the yield difference between 2 dates equals or exceeds the LSD value than there is a 19 to 1 chance that the yields truly are different for the 2 dates and not due to environmental or experimental conditions

Table 2. Grain characteristics and yield of unprocessed and processed grain of three varieties harvested on several dates during 1975.

Harvest Date	Unprocessed green grain				Processed grain			Total processed grain ² (pounds/A)	
	Dark kernels (percent)	Grain moisture (percent)	Grain wt. at harvest (pounds/A)	Dry wt. of grain ¹ (pounds/A)	Recovery, green wt. basis (percent)	Whole kernels (pounds/A)	Broken kernels (percent)		
K2 variety									
Aug. 27	9	42	837	480	12	85	14.1	99	
Sept. 2	16	42	1262	738	33	361	12.2	411	
8	32	37	1730	1086	37	562	12.0	639	
12	36	33	1471	980	44	591	8.7	647	
16	40	33	1487	996	44	559	13.1	643	
22	62	39	1137	697	47	489	8.1	532	
				LSD .05	143			LSD .05	82
M1 variety									
Aug. 27	8	42	533	312	13	57	19.7	71	
Sept. 2	9	43	987	559	33	275	14.6	322	
8	25	37	1164	730	36	365	13.1	420	
12	35	34	1280	844	43	479	13.1	551	
16	40	33	1162	783	43	482	3.6	500	
22	57	37	1080	676	46	453	9.4	500	
				LSD .05	127			LSD .05	94
Johnson variety									
Sept. 2	13	39	1869	532	26	200	12.7	229	
8	18	40	1029	617	32	294	10.0	327	
12	29	36	1135	720	40	373	18.4	457	
16	34	35	947	608	40	364	4.0	379	
22	36	40	836	500	44	336	9.7	372	

¹Includes hulls; 2 percent moisture

²7 percent moisture

**Table 3. Kernel size of processed grain from several harvest dates during 1973 and 1974.**

1973			1974		
Harvest Date	Kernel length (mm)	Kernel width (mm)	Harvest Date	Kernel length (mm)	Kernel width (mm)
Aug. 27	9.5	1.3	Aug. 29	9.8	1.2
29	9.8	1.4	Sept. 3	9.8	1.4
31	9.8	1.5	6	9.6	1.3
Sept. 4	9.7	1.5	9	9.8	1.5
7	9.5	1.6	12	10.1	1.5
10	9.7	1.7	16	10.0	1.7
12	10.0	1.8	19	10.0	1.6
			26	9.7	1.5
	LSD .05 NS	0.1		LSD .05 NS	0.1

Moisture content of the grain was determined at each harvest date (tables 1, 2). Except for 1974 when cool temperatures delayed maturity, it appears that highest processed grain yield is obtained for all 3 varieties when grain moisture is in the range of 34 to 39 percent (tables 1, 2).

The percentage of dark kernels is a good estimate of when to begin harvesting (tables 1, 2). Dark and green kernels are separated from a random sample of grain. Dark kernels are those

with at least 75 percent of the kernel surface area dark. The percent of dark kernels at highest processed grain yield was 35 for 1973 and 1975 when averaged for the two years and the three varieties. It was lower for 1974 at highest yield because of the early freezing temperatures. Growers should determine harvest date by taking all the panicles of several plants selected at random and determining the percentage of dark kernels.

Table 4. Germination of seed and number of established plants from seed harvested at several dates.

Harvest Date	Germination percentage		Percentage of seeds that developed into plants ²
	75 days ¹	175 days ¹	
1973			
Aug. 27	13	19	5
29	28	28	10
31 ³	7	10	5
Sept. 4	38	56	17
7	48	50	26
10	44	57	26
12	35	48	29
1974			
Sept. 3	14	34	7
6	12	41	8
9	26	56	21
12	40	67	10
9	22	54	17
26	30	68	24
1975⁴			
Aug. 27	14	10	2
Sept. 2	14	20	7
8	16	34	16
12	25	35	17
16	40	56	29
22	36	42	19

¹After storage in water at 35°F

²144 seeds planted in flooded soil

³Values low due to storage problems

⁴Average for three varieties

The percent recovery, which is the amount of processed grain obtained from freshly harvested grain, increased from early to late harvest date (tables 1, 2). However, the increase in recovery did not offset the losses due to shattering at the later dates, which is indicated by comparing total processed grain over harvest dates. Losses to blackbirds were not a factor since the plots were patrolled or covered with netting. The percentage of broken kernels tended to decrease from early to late harvest but not consistently. Kernel length did not significantly increase with maturity for both years (table 3). In general, kernel width, however, increased from early to late harvest for both years indicating an increase in kernel plumpness as the grain matures.

Seed quality for planting generally increases from early to late harvest as evidenced by germination percentage and the number of plants that become established from a given amount of seed (table 4). However, the seed quality is not significantly different for the last four harvest dates. Thus, growers could obtain good quality seed when harvesting for maximum yield.

Nonshattering wild rice should be harvested for maximum yield of processed grain when 35 to 40 percent of the kernels are dark. This generally occurs when some of the seeds have fallen off from the main stem but very few from the tillers of the same plant. If kernel plumpness is desired at the expense of yield, then later harvest should be considered. However, many other factors also must be considered when deciding to begin harvesting. The vulnerability to frost, rain, wind, and blackbirds in conjunction with many acres and few combines encourages starting early.