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Seeding Time, Method, and Rate for Wild Rice Grown as a Field Crop

Wild rice *(Zizania aquatica L.)* is an annual that grows from seed each year, but requires seeding only the first year in cultivated fields. After the first year, both the shattering and shatter resistant varieties reseed themselves. Usually, enough seed shatters from plants before harvest, lies dormant over the winter and germinates the next spring after flooding so that more than adequate plant populations are present during succeeding years of cultivation. However, if the soil is very dry after harvest for several weeks, or if the plant population was very sparse in some areas the previous year, it may be necessary to reseed second year or older fields at a low seeding rate.

If fields are being developed for wild rice in virgin areas where a considerable amount of vegetation is tilled under, it is desirable to till the area a year or more before planting wild rice. It may also be desirable, particularly on peat soils, to grow small grains, such as oats, a year or two before planting wild rice. Keeping the field in upland conditions for 1 or 2 years allows the vegetation to decompose and thus cause fewer problems in gas formation and floating peat when fields are flooded. These problems can cause difficulties in establishing stands.

FALL OR SPRING SEEDING

Fall seeding has been successful for many growers, in experimental nurseries at Grand Rapids, and in a 2-year experiment conducted at St. Paul. Table 1 shows the results of the St. Paul experiment comparing spring and fall seeding. Here, to obtain the maximum number of plants from a given amount of seed, it was best to plant in the fall, cover the seed with one inch of soil, and then flood immediately. This method resulted in 52 percent of the planted seeds becoming established plants in the spring. It was important to cover seed with soil or water in the fall to avoid desiccation of the seed during the winter. Covering the seed with soil also resulted in fewer floating plants in the spring—plants that normally will not become established and eventually die.

Table 1. The influence of seeding date, flooding date and seeding method stand establishment in silt loam soil, St. Paul, 1973-74.

	Established plants in spring*	Floating plants in spring*
Fall planted-spring flooded	%	%
seed on soil surface	10.3	0.5
seed 1 in. below soil surface	39.6	0.0
Fall planted-fall flooded		
seed on soil surface	21.3	7.4
seed 1 in. below soil surface	52.0	0.1
Spring planted-spring flooded		
seed on soil surface	20.3	30.3
seed 1 in. below soil surface	44.5	0.0
$LSD^{**}_{.05}$	7.5	3.6

*Percent of planted seeds.
**The LSD (Least Significant Difference) is a statistical measure used to compare mean values in the same column. If the difference between 2 means is equal to or greater than the LSD value, then the means for the 2 treatments are statistically different and not due to other causes.

Fall seeding has the advantage of eliminating the need to store wild rice seed over the winter. If seed is not properly stored during the colder months, poor germination can result. In addition, seeding in the fall is desirable because fields are generally drier and ground equipment can be used. No yield differences have been observed between spring and fall seeding if plant populations are comparable and spring seeding is done as early as possible.

METHOD OF SEEDING

Seeding wild rice by drilling appears to be more ideal than broadcasting followed by rototilling or water seeding. This was shown in a 3-year experiment conducted at the Minnesota Agricultural Experiment Station in Grand Rapids during the spring with three seeding methods on mineral soil. The simulated drilling method produced a higher plant population and yield than the broadcast or water seeding method (table 2). However, in most years, because of wet conditions in the spring, it may be necessary to seed by air. Such seeding should be done after the fields are flooded with at least 1 inch of water. When aerial seeding, the seeding rate should be increased by approximately one fourth to compensate for the reduced success in plant establishment. The above results would apply whether seeding in the fall or spring.

Table 2. The influence of three seeding methods on plant population and yield during 1973-75 at Grand Rapids. A seeding rate of 45 lb/acre was used for each method.

Planting method	Plant population	Yield*
	plants/ft²	*lb/acre*
Water seeded	1.5	773
Broadcast onto soil and rototilled	1.9	1438
Seeded into 1 in. deep trenches 12 in. apart	2.1	1676
$LSD_{.05}$	0.5	538

*40 percent moisture.

Broadcasting seed onto the soil surface and then covering the seed by shallow discing rather than rototilling appears to be a good alternative method to drilling on peat soils. An experiment confirming this was conducted on a grower's peat soil field near Gully during the fall with flooding delayed until

spring. In this case the number of established plants and yield were nearly the same whether seeding with a grain drill or broadcasting the seed onto the soil by hand and then shallow discing the seed into the soil (table 3).

Table 3. Plant population and yield of wild rice drilled and broadcast into peat soil in the fall of 1976 near Gully.

Seeding procedure	Plants/ft^2	Yield (lb/acre)*
With grain drill	1.1	1189
Hand broadcast and disced	1.0	1180
$LSD_{.05}$	NS	NS

*40 percent moisture.

Regardless of method or time of seeding, seed should not be allowed to dry below 28 percent moisture during planting. It is best to drain the water from the seed just before planting and not to allow wet seed to heat up. After the surface moisture from the seed has drained, the seed can be mixed with oats in a ratio of 2 to 3 pounds of oats for each pound of wild rice. This will allow the wild rice to flow more uniformly through the seeding equipment. Success in seeding depends upon prompt covering of seed by soil or water to maintain germinability and reduce losses to birds.

RATE OF SEEDING

A seeding rate experiment with the nonshattering varieties using commercial seed lots was conducted at the Minnesota Agricultural Experiment Station in Grand Rapids to determine the optimum seeding rate. It was shown that a seeding rate which results in four plants per square foot is the most desirable because yield increases as population increases to four plants per square foot for all varieties (figure 1). Higher plant populations resulted in more lodging, particularly for the Johnson variety. Incidence of leaf disease was more prevalent at the higher plant populations.

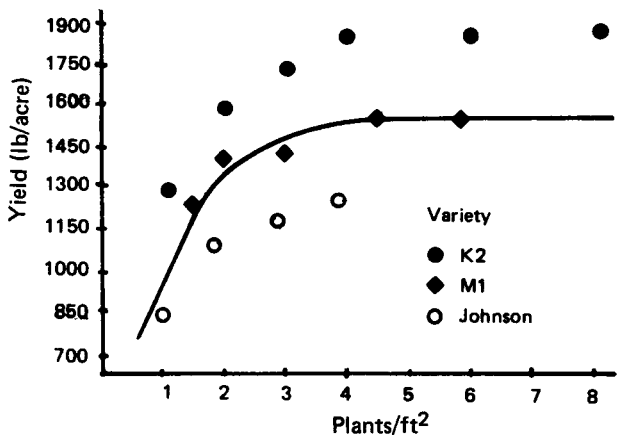

Figure 1. Relationship of grain yield (40% moisture) and plant density for three varieties grown in Grand Rapids during 1974.

A seeding rate of 30 to 45 pounds per acre of good quality seed should give an adequate plant population. However, the amount of seed needed to obtain the optimum plant population will vary considerably with seed quality, as shown in table 4. In this experiment, germination of the seed varied from 30 to 65 percent. However, germination of seed can range from 15 to 95 percent and moisture percentage can vary from 35 to 50 percent. It appears that only 60 percent of the seeds which germinate become established when using the seeding method of broadcasting the seed onto the soil followed by shallow incorporation

Table 4. Plant population obtained with 6 different seeding rates of three nonshattering varieties during 1975 at Grand Rapids.

Variety	Seeding rate (lb/acre)* 5	15	30	45	70	100	Germination of each seed lot
	---- Plants/ft^2 ----						%
Johnson	0.4	0.9	1.2	1.8	2.8	3.7	30
K2	1.1	2.0	3.1	4.0	5.9	8.2	65
M1	0.8	1.3	2.0	3.0	4.5	5.8	46

*Weight after winter storage in water and surface moisture allowed to dry from seeds.

Good seed should have a minimum germination of 65 percent, be free of weed seeds and debris, and have a high percentage (35 percent or more) of dark kernels. It is advisable to clean seed by air or gravity cleaner before fall seeding or winter storage for spring seeding. Germination percentage can be obtained in the fall by taking a random sample of 100 seeds, removing the hulls and then carefully removing the black layer (pericarp) above the embryo with a scalpel or razor blade. (The embryo is located opposite the long narrow ridge on the kernel.) The seeds should then be immersed in water at room temperature with the water changed every day. At the end of two weeks germination counts can be taken. In the spring, germination percentage can be obtained by placing intact seeds into water at room temperature for two weeks.

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