

Good Stands for Top Alfalfa Production in Michigan

Extension Bulletin E-1017, July 1984 (Revision, destroy all previous editions).

by Milo B. Tesar

Department of Crop & Soil Sciences

Alfalfa stands in Michigan are frequently so poor that high yields can't possibly be obtained. The steps given here should help insure the kind of stands necessary (at right) for 5- to 6-ton yields on many sandy loams and loam soils and 6 to 8 tons on the most fertile, well-drained soils. Table 1 shows soil management groups suited for good alfalfa production. If naturally well-drained or tilled, all textures 1 to 5 are suitable for good alfalfa production.

Table 1. Interrelationship among soil management groups.

Dominant Soil Profile Texture	Symbol	NATURAL DRAINAGE		
		Well Drained (a)	Poorly Drained (b)	Poorly Drained (c)
Fine clay	0	0a	0b	0c
Coarse clay	1	1a	1b	1c
Clay loams	1.5	1.5a	1.5b	1.5c
Loam and silt loam	2.5	2.5a	2.5b	2.5c
Sandy loam	3	3a	3b	3c
Loamy sand	4	4a	4c	4c
Sand	5	5a	5b	5c
Muck or peat				Mc

Test soil — Test the soil prior to seeding and follow soil test recommendations (See "Fertilizer Recommendations for Vegetables & Field Crops," Extension Bulletin E-550, 1981). Apply lime, preferably 3 to 6 months before seeding, and incorporate into the soil



Figure 1. Adequate lime should be added, preferably 3 to 6 months before seeding, and incorporated to bring the pH to 6.8 or above.



to bring the pH to 6.8 or above (Figure 1). If time is limited, apply lime just before seeding rather than not using lime. Low pH is still a primary reason for low alfalfa yields in Michigan. Corn will grow well on a soil of pH 5.5, but alfalfa will not. In rotations, soil should be sweetened for alfalfa. This will also improve the yield of the subsequent corn crop.

Good seedbed — Minimum tillage in the spring (usually plowing and one tillage operation before seeding) is adequate (Figures 5 and 6). In summer, a firmer seedbed is required to prevent drying so cultipacking before seeding is advised, especially on loose seedbeds or loamy sand soils.

Fertilize according to soil test — High yields of 5 to 8 tons of alfalfa in the year after seeding generally require about 400 to 600 pounds of 6-14-42 or equivalent when seeded with oats in the spring or 0-14-42 when seeded without oats in the summer. More potassium is recommended for high yields—about 200 to 300 pounds of 0-0-60 in the fall of the seeding year or the next spring after the first cutting. Potassium is the key for high yields and good winter hardiness.

Phosphorus is important for rapid root growth and strong seedling development. Even if the soil test indicates phosphorus is not necessary, use of a starter fertilizer containing 25 pounds of phosphate is advised to get strong seedling development. Phosphorus under the seed

is particularly important to make band seeding effective (Figure 3).

Control of quackgrass and other weeds — If quackgrass is a problem in spring seedings, spray glyphosate (Roundup) at 1½ lb active ingredient (2 quarts) per acre on actively growing quackgrass at least 8 inches tall (about mid May). Plow after at least 3 days to effectively control quackgrass (see Extension Bulletin E-434, "Weed Control Guide for Field Crops"). Frequent tillage (every 10 days) after small grain harvest, or from July through October, will also kill or suppress quackgrass for a spring seeding.

For summer seedings, quackgrass can also be controlled by tillage after heavy pasturing in May to reduce grass vigor and to use the grass produced. Till every 7 to 10 days until late July. To kill or suppress quackgrass, begin plowing or disking in late May.

If winter annual broadleaf weeds such as shepherd's purse, downy brome, yellow rocket, peppergrass or the perennial chickweed are likely to be a problem, the herbicide Eptam is recommended. Eptam applied pre-plant will generally give good control of these weeds (also see Balan under CLEAR SEEDINGS). Or apply 4-(2, 4-DB) after the alfalfa is 1 to 2 inches tall. This will control all the above weeds except downy brome. Only 4-(2, 4-DB) can be used for weed control if a forage grass is seeded with the alfalfa. If not controlled, these weeds will reduce the vigor and density of the stand. The result will be a weedy first cutting in the next year and, possibly, a weak stand for several years.

Adapted seed — Use varieties resistant to bacterial wilt and *Phytophthora* root rot (PRR). Resistance to PRR is particularly important where soil drainage is not ideal. Resistance to anthracnose is advisable in the southern half of Michigan. Use varieties which have performed well in MSU tests and are listed in current issues of varietal recommendations for alfalfa. For short- to medium-term



Figure 2. Inoculate seed just before seeding with specific alfalfa Rhizobia inoculant or use pre-inoculated seed.

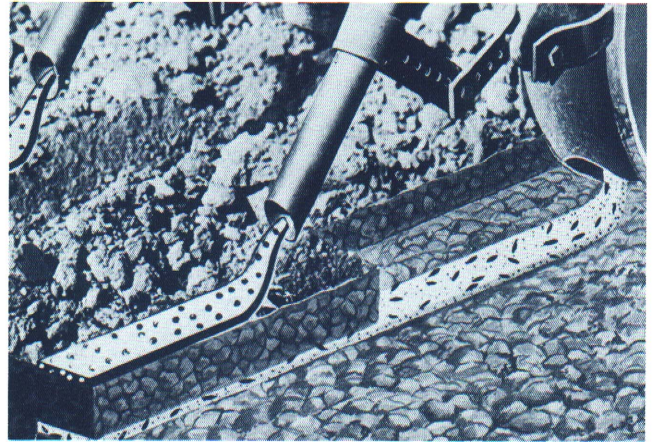


Figure 3. In band seeding, legume seed is placed in a band on or near the surface (0 to ½ inch) directly over a band of fertilizer (and small grain) placed 1 to 1½ inches deep. The phosphorus in the fertilizer stimulates rapid root and seedling growth.

stands (2 to 4 years), use varieties which are hardy or moderately hardy. For long-lived alfalfa for 5 years or more, for pasture, or on imperfectly drained soils, use hardy high-yielding varieties. Use MSU-recommended PRR-resistant varieties whenever possible, especially on imperfectly drained soils where PRR is likely.

Seeding rates — Twelve to 16 pounds of alfalfa and 3 to 4 pounds of brome or 2 pounds of orchardgrass per acre (when grasses are used) are recommended for both short- and long-term stands. For long-term stands, particularly, 16 pounds per acre are recommended.

Inoculation — Inoculate seed by hand with specific *rhizobia* bacteria for alfalfa before planting. This insures that the plant will act as a nitrogen factory. Free nitrogen is taken from the air by the nodule on the root and is then incorporated into the plant. Use the slurry method on moistened seed (Fig. 2). See directions on the inoculant container or use pre-inoculated seed for spring planting. If pre-inoculated seed is used for summer seedings, it should be re-inoculated by hand (Fig. 2). The cost of inoculation is nominal—only about 50 cents per acre.

Lime coated seed is not recommended. MSU tests between 1976-81 show that, compared to normal inoculation, lime-coated seed does not improve stands, inoculation, or yields of alfalfa grown on soils limed to pH 6.8 or above, as recommended for good production. In MSU tests, the number of seedlings per pound of lime-coated seed product planted was only two-thirds of that of a pound of the same pure seed planted. This is because about one-third of the lime coated seed is lime. If 15 pounds of lime coated seed are planted, for example, only 10 pounds of actual seed are planted.

Band seed above fertilizer — Band seeding is first choice for good stand establishment. It insures shallow planting—¼ to ¾ inch. The alfalfa seed is placed on top of the ground in a band above a band of fertilizer

Table 2. Percentage stands of alfalfa seeded at 9 to 11 lb. acre on two soil types and dry weights of seedlings/sq ft (3-year average). Average Conover Silt Loam and Hillsdale Sandy Loam Soils, East Lansing, MI.

Seeding Machine	Compaction (a) Method	% Stands Seeded in (b)		Seeded Aug. 26, % Weight Nov. 1
		Spring	Summer	
Band seeder drill	None	75	54	45
Band seeder drill (Fig. 5)	Press Wheels	106	112	167
Band seeder drill (Fig. 5)	Cultipacker	100	100	100
Cultipacker seeder (Fig. 6)	Cultipacker seeder	84	74	59

(a) Seed banded over fertilizer except treatment 4, broadcast over fertilizer.

(b) 6 trials in spring, subsequent rains; 5 in summer, 3 without rain.

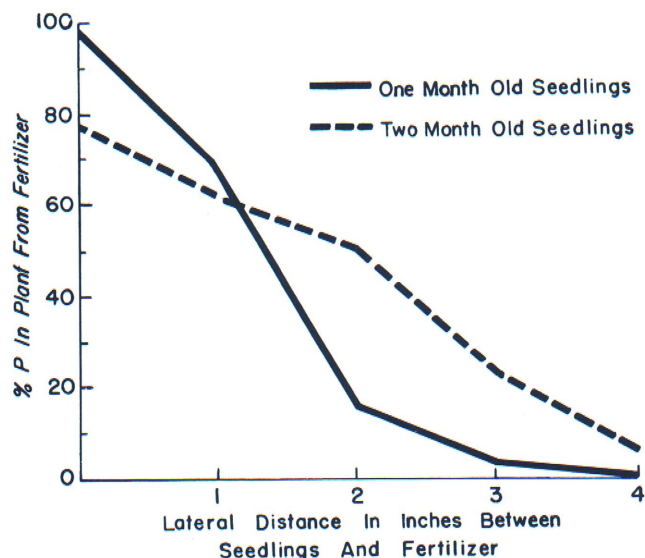


Figure 4. Alfalfa banded directly over phosphorus fertilizer is stimulated by the phosphorus, but alfalfa 3 to 4 inches away (as in broadcast seeding over banded fertilizer) gets very little benefit from the fertilizer in the first two months' growth.

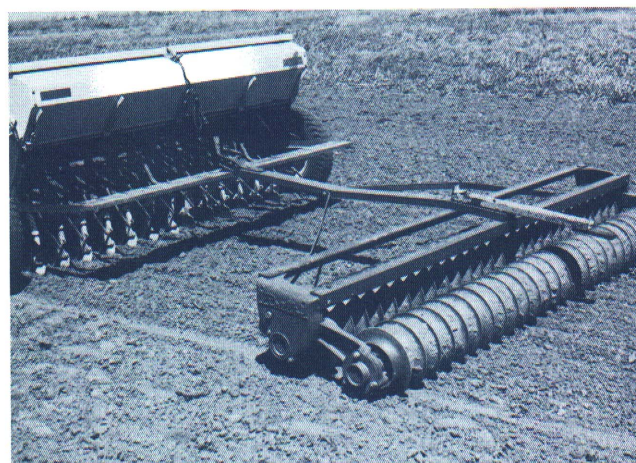
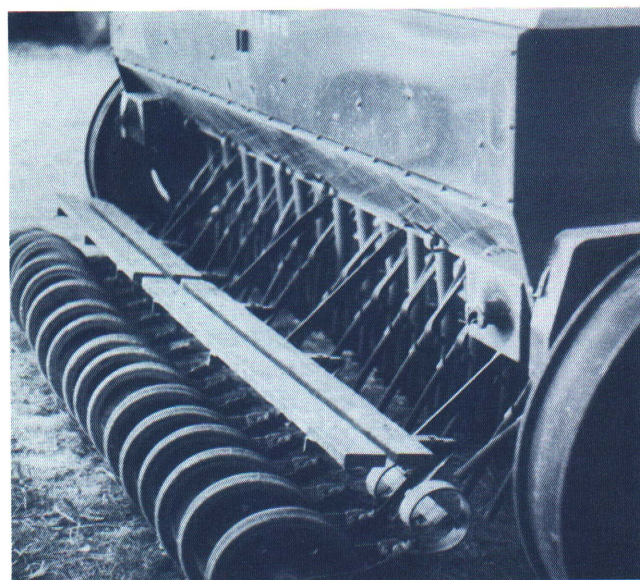


Figure 5. The fertilizer-grain drill with band seeder attachment places the seed shallowly over a band of fertilizer (Figure 3) to get maximum stimulation for the seedling from the phosphorus (Figure 4). Press wheels (top photo) cover the seed shallowly with soil and firm the soil around the seed for good germination. If press wheels are not available, a cultipacker (lower photo) gives almost as good a stand as press wheels.

(and small grain such as oats) placed 1 to 1½ inches deep (Figures 3 and 5). Band seeding gives better stands, more vigorous seedlings, and much more uniform stands than broadcast seedings since all seedlings are adequately fertilized with phosphorus which stimulates root development and top growth (Figure 4). Rapid seedling growth enables the plant to compete more favorably against weeds, drouth, or the companion crop.

A cultipacker seeder, Figure 6, is second choice for seedling establishment. The seeder places the seed shallowly and covers the seed with firmed soil after broadcast fertilization. MSU research shows the cultipacker broadcast seeder is almost as effective (84%) as a band seeder followed by a cultipacker in spring, but it is less effective (74%) in getting a good stand in summer, Table 2 and Figure 7. The considerably greater vigor of the band-seeded alfalfa shown in Table 2 and Figures 4 and 7 is due to greater stimulation from phosphorus and better seed coverage when band seeded and cultipacked.

Use press wheels or a cultipacker — Press wheels or a cultipacker (Figure 5) towed behind the band-seeder drill improve stands in the spring but considerably more so in the summer, Table 2. With no cultipacker, spring seedings were 75% as good as when a cultipacker followed the band seeder. In summer, seedings without the cultipacker were only 54% as good, indicating the great need for covering the seed and compacting the soil over it during the drier part of the season (Table 2, Figure 7).

Press wheels are slightly more effective than a cultipacker in spring (6%) and more effective in summer (12%) (Table 2, Figure 7). Both achieve shallow seed coverage and soil compaction around the seed. If press wheels are not available, a cultipacker is an excellent method of covering the seed shallowly and firming the soil around the seed.

SPRING OR SUMMER SEEDINGS?

MSU studies have shown that successful stands of alfalfa can be established in spring or summer. More than half of Michigan's million-plus acres of alfalfa are sown with oats as a companion crop in April or early May. About ¼ of spring seedings are made using a preplant herbicide and without oats. (See Clear Seedings, page 6). About 1/5 of the acreage is seeded in summer after wheat harvest or summer fallow. MSU results show that spring seedings made in oats or summer fallow were about 10% higher yielding than summer seedings in the year after seeding. They were equal in the second harvest year, and then generally less productive than summer seedings in the third and successive years. Excellent stands can be obtained with either spring or summer seedings; timely seeding is important.

Summer seedings are an excellent way to make seed-

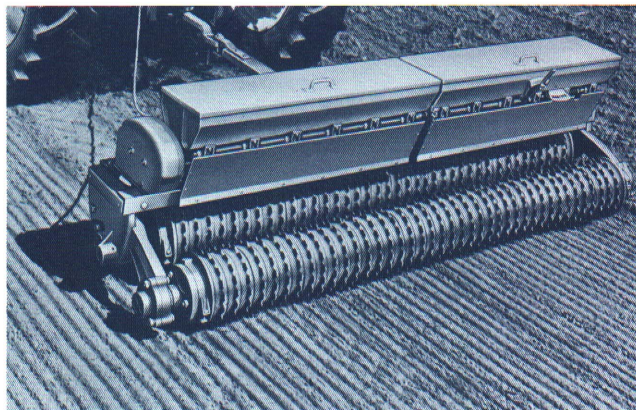


Figure 6. A cultipacker seeder is second choice as a method of establishing alfalfa but is still an excellent seeding machine. The seed is placed between the front and rear rollers and covered shallowly by the rear roller. Fertilization with other equipment prior to seeding is required.

ings after wheat is harvested in late July or early August, or after summer fallow. They are an alternative for farmers who do not seed with oats in the spring, or may want to control perennial weeds, including quackgrass, with herbicides prior to alfalfa establishment.

Spring Seedings

Seed on time. Plant as early as possible in April as a good seedbed can be prepared without injuring soil structure. Alfalfa grows well at low temperatures and gets a head start on weeds which generally need warmer temperatures to germinate. Seedings with oats can generally be made as late as early May in southern Michigan and up to two weeks later in the Upper Peninsula. Clear seedings (see page 6) with an herbicide can be made anytime in spring (or in summer up to August 15 in southern Michigan and August 1 in northern Michigan).

Companion Crops — Oats provide good income during the seeding year, and reduce weed competition and erosion. They are not necessary to help the seeding as was once believed. Companion crops take water, light, and nutrients but are generally used because of the income provided. Oats is considered a good companion crop since it is not too competitive (as, for example, wheat), is removed early, has good feed value, and may be cut or grazed if it lodges and threatens the seeding.

Oat and weed competition — Competition from the oat crop can be reduced in spring seedings by removing oats early for silage, or by grazing, particularly on sandy, droughty soils. When harvested for silage in the early-boot stage, the feeding value of oats per acre is increased 50 percent over the harvested grain.

Oat competition can be reduced by grazing for no more than a week in late May or early June, removing livestock for 5 to 6 weeks, and grazing again for a week. Mow uneaten oats or weeds, if necessary, as closely as possible, after the second grazing. Mowing will not injure the alfalfa. Clippings need not be removed.

MCPA (3/8 pound active ingredient per acre) sprayed when the oats are 6 to 8 inches tall and fully tillered, but before the boot stage, will reduce competition from broad-leaved weeds. The oat canopy will prevent appreciable injury to the alfalfa. Dinoseb (Preemerge) at 1.1 lb. a.i. per acre (1½ qt) is another option. Dinoseb is a contact herbicide and should be applied in early spring when the small grain is 2 to 6 inches tall and weeds are small. Refer to Extension Bulletin E-434 "Weed Control Guide for Field Crops" for details.

Oat stubble should be clipped and removed after combining to reduce danger of disease or killing of the alfalfa under windrows. Mowing as low as possible (1½ to 2 inches) will generally do an effective job in broad-leaved weed control and will not harm the alfalfa.

Select an early maturing, stiff-strawed oat variety to reduce competition. Reduce the rate to 1½ to 2 bushels of oats in spring seedings on heavy, fine-textured, well-fertilized soils in soil management groups 0 to 1.5 (Table 1) to reduce oat competition and lodging. Reduce oat rates to 1 bushel per acre on coarse-textured soils (group 3) to reduce competition.

Clear Seeding on Loamy Sands — Oats as a spring-sown companion crop is too competitive for moisture on droughty, sandy soils in soil management group 4 (loamy sand) and especially, group 5 (sand). Alfalfa seedings under such conditions will likely be failures. Summer seedings made on these droughty soils are almost sure to fail. The best solution is to clear-seed in spring (April or late May) to use the spring moisture for good seedling establishment (see Clear Seeding, page 6). Complete instructions can be found in Extension Bulletin E-961, "Clear Seeding of Alfalfa."

Summer Seedings

Seed on time. Timely summer seeding is even more important than seeding on time in the spring since the plant must be large enough to survive Michigan's winters.

The best seedings are made in late July or early August in southern Michigan and mid-July in the Upper Peninsula. In MSU tests at East Lansing and Lake City, the next year's yield was reduced by ½ ton for each week's delay of alfalfa seeded between July 27 and September 11 (Table 3). The greatest decrease in yield was in the latest 2-week period, between August 27 and September 11. The weaker seedlings from late seeding carry over into the second harvest year with resulting lower yields, although there is less difference due to late seeding than in the first harvest year.

Seedings should not be made later than August 1 in northern Michigan or August 15 in southern Michigan. Seedings in late August are apt to be failures, especially in northern Michigan. *September seedings of alfalfa are too likely to be failures and are not recommended anywhere in Michigan.*

Seed alone in summer. Oats should *not* be used in summer seedings because of strong competition for water on any soil management group, especially groups 4 and 5. Oats have reduced stands and next year's yields in summer seedings in MSU research at Lake City in northern Michigan and at East Lansing (Table 3).

Summer seedings are generally improved if a preplant or postemergence herbicide (see page 2) is applied to control broadleaf winter annual weeds.

Don't seed in wheat. Alfalfa should not be seeded with wheat in the fall because of the danger of winter injury (see Sept. 11 seedings, Table 3). Spring seeding in wheat in MSU tests has resulted in erratic stands lacking the



Figure 7. Summer seeded alfalfa generally has the best stands if seeded with a band seeder drill with press wheels (right). A cultipacker instead of the press wheels gives almost as good a stand (center). Broadcast seeding with the cultipacker seeder produced a poorer but satisfactory stand (left).

Table 3. Effect of seeding dates in summer on Vernal alfalfa yields in the first and second years after seeding.

Method of seeding alfalfa	DATE OF SEEDING			
	July 27	August 13	August 27	September 11
EAST LANSING — CONOVER LOAM (2-YEAR AVERAGE)				
First year after seeding				
Alone	5.03	4.80	3.74	2.25
plus oats, not removed	2.70	2.53	2.22	1.72
plus oats, removed Oct. 3	3.06	3.30	2.60	2.13
Average	3.59	3.54	2.85	2.04
Second year after seeding				
Alone	—	4.55	4.07	3.99
plus oats, not removed	—	4.24	3.61	3.78
plus oats, removed Oct. 3	—	4.03	3.89	4.34
Average	—	4.27	3.86	4.03
LAKE CITY — NESTOR SILT LOAM (ONE-YEAR AVERAGE)				
First year after seeding				
Alone	2.57	2.16	1.70	1.25
Second year after seeding				
Alone	4.46	4.79	3.64	3.41

uniformity necessary for high yields for forage for livestock. Plowing the wheat stubble under and making a summer seeding in early August gives as good or better stands as when spring seeded in oats. It provides a much better stand than when alfalfa is seeded with wheat in the fall or on top of wheat in spring.

Fall Management

Alfalfa that is spring seeded with oats can be cut safely after October 15, if it is at least a foot tall. Growth of alfalfa has stopped by this date and no injury will result.

Clear Seeding

Making Spring Seedings with Herbicides and No Oats.

Two and one-half to four tons of alfalfa seeded alone in spring on productive soils can be harvested in the year of seeding if no companion crop is used. (See Extension Bulletin E-961, "Clear Seeding of Alfalfa," for more detail on clear seedings.) Clear seedings are generally better than seedings in oats. They are recommended where spring seedings in oats have not been as good as desired or where there is little use for the oat crop for grain, silage, or pasture. Follow suggested seeding practices for spring seeding above but make the following changes for alfalfa to be harvested in the seeding year:

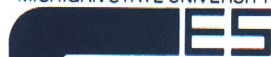
1. Be especially careful to have good drainage, a good seedbed, recommended phosphorus and potassium starter fertilizer, band seeding followed by press wheels or a cultipacker, and seeding as early as possible in April.

2. Spray pre-plant and incorporate 3 pounds a.i./acre (3½ pints/acre) EPTC (Eptam) as first choice or benefin (Balan) at 1 1/8 pounds a.i./acre (3 quarts/acre). Or, use one pound a.i./acre (2 quarts/acre) 4-(2,4-DB) (Butoxone or Butyrac 200) postemergence when the alfalfa seedlings have two or three trifoliate leaves (1 to 2 inches tall) and the broadleaved weeds are small. If broadleaved weed problems develop after using EPTC or benefin pre-plant, 4-(2,4-DB) can also be used. Only 4-(2,4-DB) can be used if grasses are seeded with alfalfa.

3. Cut twice in central or northern Michigan (mid-July, second cutting any time if flowering) or cut three times for greater yield in southern Michigan (early July, August 15-25, after October 15).

4. Topdress with potassium (and phosphorus if needed) in the fall or the next year according to soil test or use 10 pounds phosphate (P₂O₅) and 60 pounds potash (K₂O) for each ton of hay expected in the year after seeding. For expected yields of 5 to 7 tons, the equivalent of about 500 pounds of 0-14-42 in the fall and 200 pounds 0-0-60 the next spring or after the first cutting are advised in the absence of a soil test.

MICHIGAN STATE UNIVERSITY



**COOPERATIVE
EXTENSION
SERVICE**

MSU is an Affirmative Action/Equal Opportunity Institution. Cooperative Extension Service programs are open to all without regard to race, color, national origin, sex, or handicap.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Gordon E. Guyer, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned. This bulletin becomes public property upon publication and may be reprinted verbatim as a separate or within another publication with credit to MSU. Reprinting cannot be used to endorse or advertise a commercial product or company.