

GROWER'S



GUIDE

FOR VEGETABLE CROPS

## DRY BEAN PRODUCTION FOR CENTRAL WASHINGTON

Success in bean production depends on following certain principles instead of trusting to chance. Some bean growers are disappointed each year because they have failed to prevent crop losses due to poor stands, diseases, weeds, or inefficient harvesting. These losses usually can be prevented as shown by the fact that some growers consistently produce high yields. They succeed by applying the following principles and practices:

### FERTILIZATION

Beans, like other crops, must have the necessary elements from the soil to be productive. Even though beans are legumes they need *nitrogen*, but less than most nonlegume crops. Many years of research and experience in central Washington suggest the following rates of nitrogen be applied for optimum yields, based on previous history of the land and suspected soil nitrogen reserves:

Previous History	N Needed for Beans
New land	140 lb/A
Small grain, straw removed	80 lb/A
Small grain, straw to be plowed under	120 lb/A
Corn, stover removed	80 lb/A
Corn, stover to be plowed under	120 lb/A
Potatoes or sugar beets	40 lb/A
Beans or peas	40 lb/A
Alfalfa	0 lb/A
Vetch or other legume, green manure to be plowed under	0 lb/A

If corn stover or grain straw are incorporated into the soil after September 1, add 40-80 lb. additional nitrogen.

The nitrogen requirement in a given field is not always easy to predict. Excessive N, whether

residual or applied, may cause excessive vine growth which delays maturity and makes harvesting difficult. Where soil N level is known to be high, early-maturing, short-vine bean varieties should be planted.

Zinc deficiency in beans is very common in central Washington, especially where soils have been leveled or where Zn has not been applied in recent years. Normal production of beans requires 10 lb/A of Zn applied every three or four years. Inorganic Zn is essentially immobile in soil; therefore inorganic Zn fertilizer must be thoroughly incorporated into the soil. If the chelate form of Zn (EDTA) is used, approximately half as much actual Zn is required. Because of its greater mobility, the EDTA form of Zn is effective when surface-applied under sprinkler irrigation.

Phosphorus and potassium needs can be determined through soil tests.\* Soils in central Washington usually need added phosphorus. The need for added potash is rare. Central Washington soils are extremely variable and require intensive sampling. Taking only one composite sample from a "uniform" area or field is not adequate.

### VARIETIES

Choose the variety to plant according to the availability of good seed, market demand, disease reaction, soil nitrate level, rate of maturity, and time of planting. Varieties successfully grown in central Washington with proper management are as follows:

\*Obtain from your county Extension office, *Fertilizer Guide—Irrigated Field Beans for Central Washington*. FG-5 (Rev.) February 1972.

Variety	Approx. Time From Planting to Cutting	Reaction to		
		Common Mosaic	Curly Top	Root Rot
Red Mexican				
Rufus	100 days	Resistant	Resistant	Tolerant
Bigbend	100 days	Resistant	Resistant	Sensitive
Pinto UI-114	95 days	Resistant	Resistant	Tolerant
Pink				
Roza	95 days	Resistant	Resistant	Tolerant
Viva	90 days	Resistant	Resistant	Tolerant
Gloria	95 days	Resistant	Resistant	Tolerant
Small White				
Chief	97 days	Resistant	Resistant	Sensitive
Bonus	95 days	Susceptible	Resistant	Sensitive
Royal Red Kidney	95 days	Resistant	Resistant	Sensitive
Black Turtle Soup	95 days	Resistant	Resistant	Tolerant
Small Flat White	90 days	Susceptible, but usually tolerant	Usually tolerant	Sensitive

**SEEDBED PREPARATION**

Preirrigate to insure a uniform and sufficient soil moisture throughout the field at planting time. When the soil has drained enough to not be sticky, carefully apply the herbicide and incorporate according to manufacturer's recommendations. Take note of the soil type, climate, and types of weeds present in choosing the kind and rate of herbicide to apply. Large amounts of trash can reduce effectiveness of weed control.

**PLANTING**

Use certified seed of recommended varieties which have been treated with a fungicide and insecticide and which have been in cool, dry storage to maintain germinability. Plant in moist soil at a uniform depth of 1 1/2 to 2 1/2 inches. Proper planting depth depends upon ability of the soil to hold moisture. Lighter soils require deeper planting.

Soil temperatures above 65 degrees F are best for rapid seed germination and stand establishment. Be sure the planter is properly adjusted to avoid seed injury and to deliver seed at the proper uniform rate and depth in each row. Recommended rates of seeding for the various bean types are as follows: Red Mexican, 60-70 lb/A; Pintos and Pink, 70-80 lb/A; Small Whites, 60 lb/A; Red Kidney and Small Flat Whites, 100-120 lb/A. If planting is done in cold soil or in fields where root rot is likely to occur, increasing the seeding rate by 10-20 lb/A will help obtain an adequate plant stand. Adequate stands and full ground cover are essential for obtaining optimum yields. Full ground cover is also essential for season-long weed control with the new herbicides.

**IRRIGATION**

Beans are shallow-rooted and are often damaged by root rot, which restricts both rooting depth and ability to utilize moisture. Although bean plants can turn a dark green color before

permanent plant damage is done, research has shown it is better to maintain higher moisture levels, especially during the blooming and pod-setting periods. This usually occurs during the peak evaporative season.

With normal rooting, effective depth for moisture utilization is the upper two feet of soil. The actual amount of allowable moisture removal between irrigations depends on the soil water-holding capacity, but will be from 1 1/2 to 2 1/2 inches in most soils. Frequency of irrigation will depend on weather. The evaporation pan method of irrigation scheduling is a good guide for determining frequency. In most cases, from five to eight days will elapse before 1 1/2 to 2 1/2 inches of water are used during peak-use periods. Extension Circular 341 explains the evaporation pan technique.

Avoid overirrigation, especially early in the season, and prevent ponding by land leveling and keeping the application rate lower than the soil infiltration rate. Leaching of fertilizer and increase of disease are caused by overirrigation.

Where application rates exceed infiltration under sprinkler systems, especially center pivots, a pitter dammer can be used to make a series of pits and dams in the furrows. The small pits confine water and reduce runoff accumulation in low areas.

## DISEASES

*Root rot* is seldom present *in land where beans have never been grown*. The disease is not often a problem in fields where only one previous crop of beans has been grown. In fields where two or more previous bean crops have been grown, root rot will nearly always occur. Chemicals have not been found to control this disease. Pinto UI-114; Red Mexican Rufus; Pinks Roza, Viva, and Gloria; and Black Turtle Soup beans are more resistant to root rot than other varieties. Some growers produce good crops in spite of the presence of root rot by use of the more resistant varieties and by careful frequent light irrigations

which supply plenty of water to reduced root systems. This is possible in soils which take water well and have a good moisture-holding capacity. In some sandy soils, however, it may be difficult to supply enough water to prevent drought during hot weather. Overirrigation and flooding contribute to root rot. Soil compaction also contributes to the severity of the disease. Breaking plow and disc pans with chisels an inch or two off-set ahead of each planter permitting deeper rooting of the plants greatly reduce effects of root rot in some soils. With rill irrigation care must be taken to keep chisels as far away from the irrigation ditches as possible. Do not use chisels after planting. Chiseling is seldom beneficial in fields where root rot does not occur. Rotations which include barley, wheat, or alfalfa have also reduced the effect of root rot.

*Sclerotinia wilt* is largely prevented by planting in land where beans have not been grown. However, it may occur in a second crop of beans and in beans following peas or potatoes. Heavy vine growth from excessive nitrogen, low wet spots (swales), and solid-stand planting favors this disease. *Sclerotinia wilt* can be controlled best by long rotations with alfalfa and other nonsusceptible crops. This disease usually does not appear in fields until the vines are heavy and old blossom parts start to drop. If it does appear, it can be controlled usually by allowing the soil surface to dry between irrigations. If fields have been adequately and uniformly irrigated, soil surface drying will not result in severe drought damage to the crop (see section on irrigation). *Sclerotinia wilt* is more easily controlled in early-maturing, short-vined varieties than in heavy vining varieties. Chemicals presently available will not control this disease.

*Seedborne common mosaic* is caused by a virus carried in seed from infected plants. It is spread from an infected bean plant to healthy plants by aphids. This disease is *prevented* by the use of resistant varieties. In susceptible varieties, the disease usually can be controlled by the

following practices: (1) plant only certified seed, (2) plant before the middle of May to avoid large populations of aphids during the earlier stages of plant growth when bean plants are more susceptible to mosaic damage. After the middle of May, plant only resistant varieties. (See list on page 2.)

*Yellow mosaic* is a virus carried by aphids from clover plants to beans. All types of clover serve as reservoirs of the virus. All bean varieties are susceptible. Therefore, beans should never be planted within several hundred feet of a clover field and, where possible, they should be planted to the windward side of clover fields. Early planting is helpful in avoiding and/or reducing damage from this disease.

*Curly top* is a virus disease carried by the sugar beet leafhopper and is *prevented* by the use of resistant varieties listed on page 2. Other beans generally are susceptible to this disease.

*Bacterial blight* is seldom a problem in our dry summer climate. However, it may cause severe damage under sprinkler irrigation if seeds infected with the bacteria are planted or if beans are planted on land following a crop of beans in which the disease occurred.

## INSECT CONTROL

Insecticides other than in the seed treatment are needed on beans only occasionally and should be applied only upon expert recommendation. However, beans may be attacked by seed corn maggots, lygus bugs, mites, aphids, and sometimes by thrips.

*Seed corn maggot* is often a problem in seedbeds containing heavy crop residues particularly if the soil is cool and wet. Light infestations are reduced by proper seed treatments. In trashy fields or early plantings in cold soil, "planter-box" applications of 1.5-3 oz. of diazinon mixed with graphite may give increased control. Phorate (Thimet) granules, 10-15 lb. per

acre (9-14 oz. per 1000 feet of row) sidedressed at planting time also greatly reduces seed corn maggot damage. *Do not place phorate directly in contact with the seeds.*

*Lygus bugs* may be controlled with dimethoate (Cygon or De-Fend) applied on foliage at bud or early bloom stage, or when pods are about one inch long. If honey bee poisoning is a problem, use ethion instead. One application of dimethoate or ethion usually is effective for season-long control if the above proper timing is used. Use a concentration of 0.5 lb. active ingredient in 5-10 gals. of water per acre for dimethoate. Use ethion at 1 lb. active in 5-10 gals. of water per acre. Label directions permit application of dimethoate up to harvest. Ethion may be applied up to 4 days of harvest.

Dylox used at 1 lb. in 5-10 gals. of water per acre may also be used, but not closer than 14 days before harvest.

*Spider mites* may become a problem late in the season when beans are planted bordering corn, red clover, alfalfa, or a dusty road. Mites may be controlled by applying dicofol (Kelthane) 0.6 lb. or dimethoate (Cygon) 0.5 lb. or ethion 1 lb. in 5-10 gals. of water per acre. Mites may also be controlled in early season by applying phorate 10% granules as a sidedress two weeks after plant emergence at 10 to 15 lbs. of granules per acre. Do not apply dicofol within 7 days of harvest or ethion within 4 days of harvest. Do not feed vines treated with these products to livestock. Control of mites after beans reach 50 percent maturity is very difficult and usually impractical.

*Aphid* control in beans is not usually necessary. Aphids are harmful to beans only in carrying viruses and there is no evidence that control of aphids within a field will reduce the spread of virus diseases.

*Thrips* are an occasional problem on dry beans. Apply sprays only when the thrip damage is apparent, and blossom and leaf loss will justify

chemical sprays. Use 0.5 lb. of dimethoate (Cygon or De-Fend) or 1 lb. of malathion in 5-10 gals. of water per acre. Do not apply malathion within 1 day of harvest.

### WEED CONTROL

Good weed control is essential. For long-season control of weeds, a combination of Eptam and Treflan in a preplant application may be used. Some crops may be injured by these chemicals the following year. Consult the label. Nightshade is a serious problem because the berries stain the bean seed and lower the grade. Where nightshade is expected to be a problem, Eptam should be applied at maximum rates followed by timely cultivations. Unless chemical control is very effective, weeds (especially Russian thistle and nightshade) can be a serious hazard in solid-stand plantings where cultivation is not possible.

### HARVEST

Early planted, early harvested crops are usually best.

*Timing:* Cut when 60% to 75% of the pods are ripe, but not all dry.

*Moisture content:* Thresh when seed moisture content is 12% to 14%.

*Cylinder speeds:* Adjust speed and spacing to reduce cracking. Cracking can be determined by placing seeds in water for three minutes. Cracks take up water and can be identified. If over 5% cracking occurs, further adjustment of the thresher is necessary. These precautions are especially critical with Red Kidney beans and any beans grown for certified seed. Drying requires from 10 to 21 rain-free days after cutting before threshing can begin.

Revised from a publication prepared in 1971 by Bill Foeppe and Roland Hintze. Revision by D. W. Burke, plant pathologist, ARS-USDA; A. I. Dow, Extension soils specialist; and Mel A. Hagood, Extension irrigation specialist, IAREC, Prosser; and G. (Ted) Hagel, entomologist, ARS-USDA, Yakima; and Robert Thornton, Extension horticulturist, WSU, Pullman.

HARVEST

Early planted, early harvested crops are usually best.

Timing: Cut when 80% to 75% of the pods are ripe, but not all dry.

Moisture content: Thresh when seed moisture content is 12% to 14%.

Cylinder speeds: Adjust speed and spacing to reduce cracking. Cracking can be determined by placing seeds in water for three minutes. Cracks take up water and can be identified. If over 5% cracking occurs, further adjustment of the thresher is necessary. These precautions are especially critical with Red Kidney beans and any beans grown for certified seed. Drying requires from 10 to 21 rain-free days after cutting before threshing can begin.

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