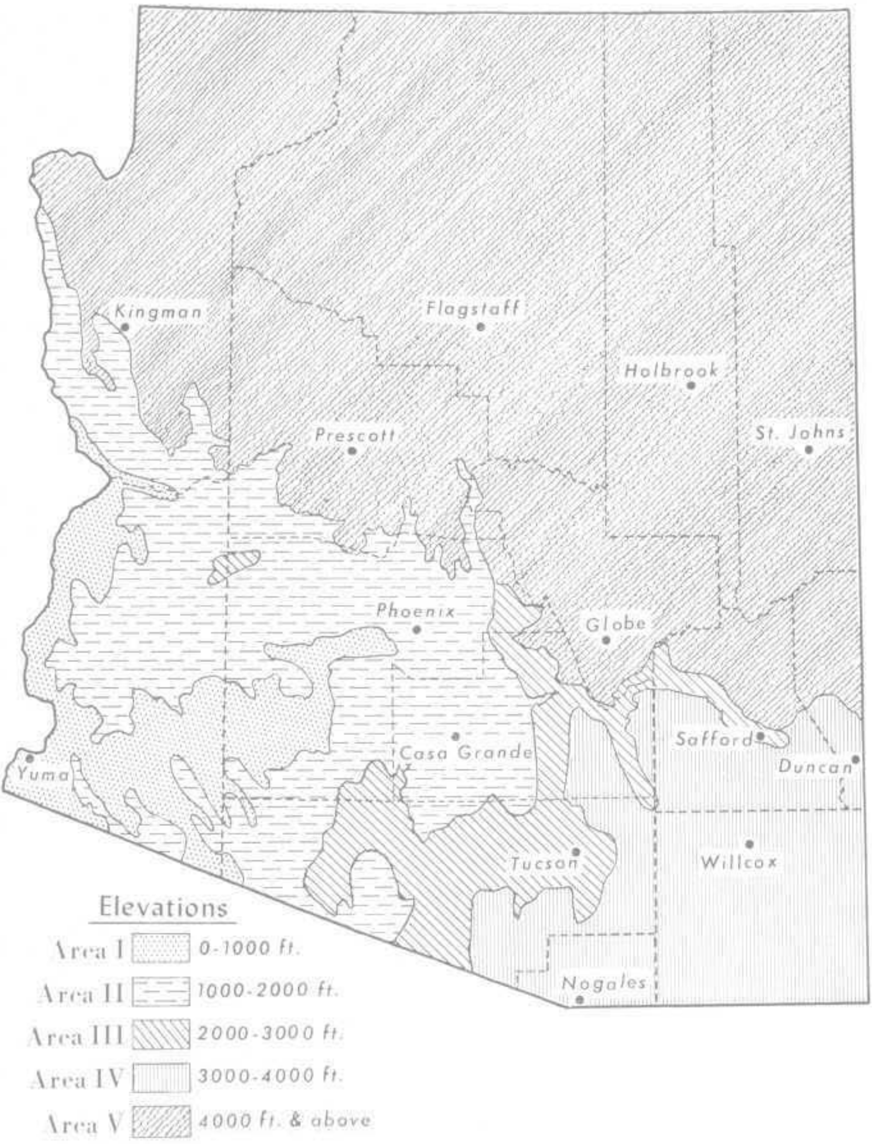
Growing

WHEAT

In Arizona

Cooperative Extension Service & Agricultural Experiment Station
The University of Arizona
Bulletin A-32



Crop Areas of Arizona by Elevations

An Extension Service Agricultural Agent's Office is located in each city and town shown on the map above.

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. George E. Hull, Director of Extension Service, The University of Arizona College of Agriculture, Tucson, Arizona. 7M — February 1964 — Bulletin A-32

Growing WHEAT In Arizona

By
R. E. Dennis
Agronomist, Cooperative
Extension Service

And
A. D. Day
Agronomist, Agricultural
Experiment Station

The University of Arizona

Introduction

Wheat is an important small grain crop in Arizona. During the period 1957-61, the average annual harvest was 65,000 acres. Acreage increased rapidly beginning in 1955, reaching a peak of 122,000 acres in 1958. The average yield of wheat during the period 1961 to 1963 was 2,580 pounds per acre.

Allotments now limit the crop to about 26,000 acres. All counties except Gila and Santa Cruz have an acreage allotment. However, the major portion of the acreage in Arizona is concentrated in the lower elevation counties.

Wheat fits well into most crop rotations used in Arizona. In lower elevation areas, wheat often follows cotton. Wheat may also follow alfalfa, sorghum, safflower, or other crops. After harvest, it is often practical to make a seeding of alfalfa.

In higher elevation areas, such as IV and V (page 2), winter wheat usually is planted in September or October and spring wheat in February. When used in this manner it must follow a crop which will be harvested early enough to permit seedbed preparation and timely planting.

Just as with barley, in lower elevation areas, wheat may be followed by a crop such as sorghum in the same year.

Much of the irrigation water used by wheat is applied during the winter months. In general, the water use by most other crops during this time of the year is at a minimum.

There are many different soil, water, and temperature conditions in Arizona. The selection of a wheat variety for a given farm or ranch must take into consideration specific growing conditions and market demand. The variety recommendations made in this bulletin are based upon tests conducted in each of the elevation areas of Arizona.

The map on page 2 divides the State of Arizona into five geographical areas based on elevation. Each wheat variety described is suggested for one or more of these areas.

Growing Seasons In Arizona

In Arizona, elevation is a major factor in determining the growing season. The period between minimum spring and fall temperatures, and the expected temperature pattern between the

Climatic Information

Area		Elevation (In Feet)	Average date last temp. below 32° - 75% reliability in Spring	Average date first temp. below 32° - 75% reliability in Fall	Avg. length of frost free period (Days)
Yuma	I	120	Feb. 18	Dec. 2	287
Mesa	II	1,225	Feb. 25	Nov. 24	271
Tucson	III	2,410	Mar. 1	Nov. 22	265
Willcox	IV	4,200	Apr. 28	Oct. 26	180

Area		Elevation (In Feet)	Average date last killing frost in Spring	Average date first killing frost in Fall	Avg. length of frost free period
Prescott	V	5,354	May 17	Oct. 8	144
Snowflake	V	5,644	May 24	Oct. 3	132

spring and fall minimums, must be considered in determining the growing season.

Growing seasons are not absolute but may vary as seasonal temperatures vary. For example, the frost-free period at Yuma may be described as being 365 days with 5 percent reliability; 340 days with 25 percent reliability; 318 days with 50 percent reliability; 287 days with 75 percent reliability; and 245 days with 95 percent reliability.

For a more complete discussion of climatic factors in Arizona refer to Technical Bulletin 151, "Temperature Tables and Their Uses in Crop Production for Ten Stations in Southern Arizona," August, 1962; and Bulletin 279, "The Climate of Arizona," Septemper, 1956.

Choice of Variety

High-quality planting seed of an adapted variety is essential for successful wheat production. Seed certified by the Arizona Crop Improvement Association is recommended whenever it is available. Certified seed is produced so as to maintain genetic identity and purity.

When selecting a variety of wheat, consider the ultimate use for the crop. Other factors are yield, winter hardiness, straw strength, and disease and insect resistance.

Milling

Most of the wheat grown in Arizona is sold for milling purposes. A popular milling wheat must have: (1) a high "milling rating," based on its over-all performance in the flour mill, (2) a high flour-extract percentage, and (3) a protein content suitable for making a high-quality product from the flour.

Forage

Barley or oats are preferred to wheat for forage. When wheat is used for forage, choose a variety that will produce the maximum amount of green-pasture forage, green chopped feed or hay. Onas 53 is a variety that has produced high forage yields throughout Arizona.

Feed Grain

For feed grain production, choose a variety that will produce the maximum amount of high-quality grain. Onas 53 has produced high grain yields throughout the irrigated areas in southern Arizona. Turkey Red and Comanche have been used successfully in the northern counties where winter-hardiness is necessary.

Ramona 50

Ramona 50 is a very early maturing, short, awnless, spring wheat with bronze colored glumes. It has stiff straw and large, white seeds that are generally hard in texture. Shattering is seldom a problem. When used in lower elevation areas, frost injury at heading may occur when plantings are made too early in the fall.

Ramona 50 tillers poorly and is a poor competitor with weeds. The variety is resistant to a number of races of bunt and stem rust, but is susceptible to septoria. It has "good" milling quality and is preferred by flour mills in Arizona. The flour is used for bread, family-type flour, and breakfast cereal.

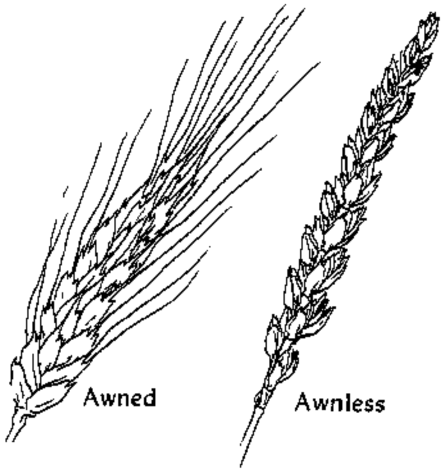
The origin of Ramon 50 is as follows:

[(Martin × Hard Federation^{3}) × Ramona^{6}]^{2} × Ramona 44.

Ramona 50 is a product of the University of California and U. S. Department of Agriculture Plant Breeders at Davis, California. The variety was released for commercial production in California in 1950 and was approved for certification in Arizona in 1957.

Ramona 50 is recommended for fall and spring planting for milling purposes in Areas I, II, and III; and for spring planting for milling purposes in Areas IV and V.

Comparison of Awned And Awnless Wheat Heads



Onas 53

Onas 53 is a medium maturity, medium tall, awned, spring wheat. It has stiff straw and medium-size, white seeds that are soft in texture. Hot winds at maturity may cause this variety to shatter.

Onas 53 tillers freely and is a good competitor with weeds. The variety is resistant to several races of bunt and stem rust. When grown in Arizona, Onas 53 had a lower milling rating than Ramona 50. The flour is used for pastries and cakes. It has produced high yields of forage and grain in the irrigated areas of Arizona.

The origin of Onas 53 is as follows:

(Kenya × Onas 41[5]) × Awned Onas 49[2].

Onas 53 also is a product of the University of California and U. S. Department of Agriculture Plant Breeders at Davis, California. The variety was released for commercial production in California in 1953 and was approved for certification in Arizona in 1957.

Onas 53 is recommended for fall planting for forage and feed in Areas I, II, and III.

Turkey Red

Turkey Red is a medium maturity, medium tall, awned, winter wheat. It has weak straw and medium size, hard, red seeds. This variety is winter-hardy and drought resistant.

Turkey Red originated in the area of Russia just north and east of the Black Sea and north of the Caucasus Mountains. It was introduced into the state of Kansas by Russian Mennonite immigrants about 1873. Turkey Red has been widely grown throughout the western United States.

This variety is recommended for fall planting in Areas IV and V where winter-hardiness is necessary.

Comanche

Comanche is a medium maturity, medium tall, awned, winter wheat. It has stiff straw and medium size, hard, red seeds. Comanche is winter-hardy and resistant to several races of bunt, stem rust, and leaf rust. The variety has good milling and baking qualities.

Comanche originated from a cross between Oro and Tenmarq and was distributed in Kansas, Oklahoma, and Texas in 1942.

This variety is recommended for fall planting in Areas IV and V where winter-hardiness is necessary.

Seedling Development, Root Development, and Tillering of Wheat

Seedling development, root development and tillering are similar for wheat, barley, and oats. (Bulletin A-15, "Barley in Arizona," pages 7 through 10.)

The fibrous root system of wheat has two parts: (1) The primary or seminal root system and (2) The permanent or adventitious root system. When a wheat seed is placed in the soil under environmental conditions favorable for germination, a small root breaks through the root sheath (coleorhiza). Additional roots develop on both sides of the first root to complete the primary root system.

The primary roots make up only a very small part of the total root system, and under favorable conditions they may penetrate the soil to a depth of 8 to 12 inches. The primary roots may or may not persist throughout the entire life of the plant.

Soon after the first root appears, the coleoptile or leaf sheath starts growing in an upward direction and the first foliage leaf emerges from the top of the coleoptile.

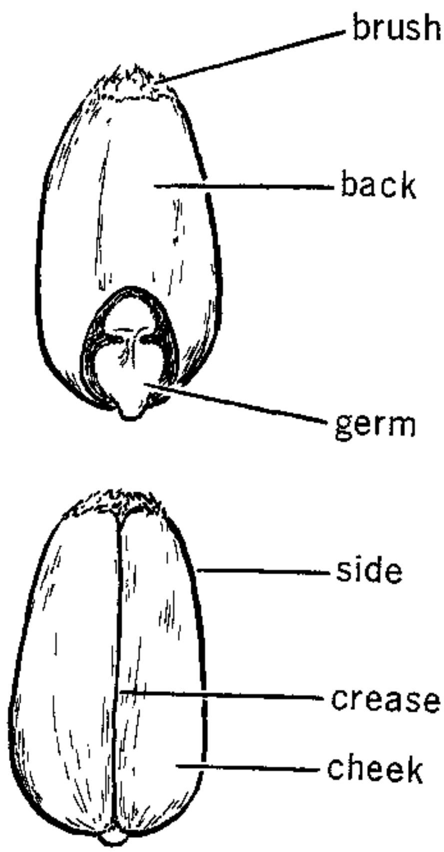
The permanent roots arise from that portion of the stem which extends from the germinating seed to the surface of the soil. The permanent root system is made up of adventitious roots which arise from the lower nodes of the main stem and its branches.

The first permanent roots appear at the tillering node about one inch below the soil level. These roots always are produced at about the same distance below the surface of the soil, regardless of the depth at which the seed is planted. The fibrous root system of a wheat plant consists almost entirely of permanent roots that often penetrate the soil to a depth of six feet.

The branching in wheat is called "tillering" and the individual branches are called "tillers."

Wheat Kernel Characteristics

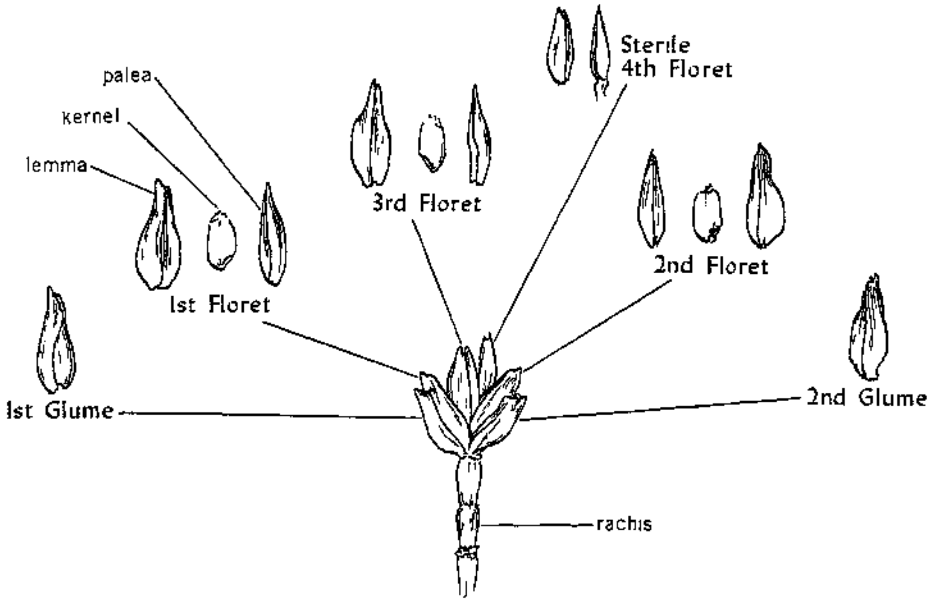
(Enlarged 8X)



Wheat and other small grains usually produce a number of stems or tillers from one seed.

When growing conditions are favorable, the primary stem (culm) from a wheat seed will produce secondary stems (tillers) which in turn produce tertiary stems. Each primary, sec-

A Wheat Spikelet and Its Parts



ondary, and tertiary stem has the potential to produce a seed head. Therefore, tillering should be encouraged whenever possible for the most efficient forage and grain production.

The tillering activity of wheat varies with the variety and environmental conditions. In general, winter types tiller more than spring types. Early planting, low rates of planting, moderately warm soil, and high soil fertility all promote tillering.

Influence of Plant Development on Pasture Management

If one desires to pasture wheat early in the season and then allow the crop to produce grain, the degree of plant development will influence pasture management. The young, actively growing plants, have many nodes and internodes (nodes are the points on the stem from which leaves arise).

The first nodes may be observed above the surface of the soil when plants are about 8 to 12 inches tall. At this time, there is considerable lengthening of the stem tissue between nodes (internodes). This is the stage of growth referred to as jointing.

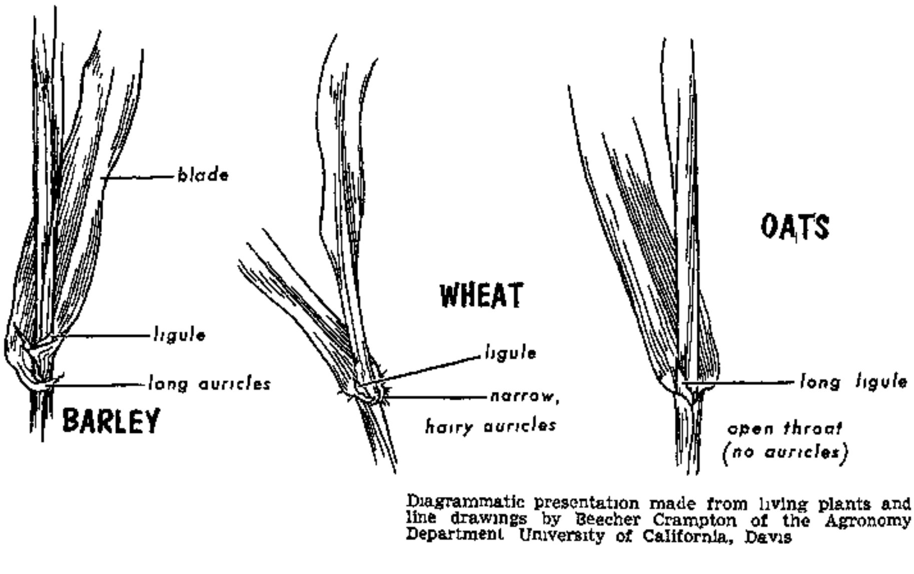
The potential grain producing head is located near the first node of each stem. When pasturing wheat, it is essential that these undeveloped heads not be removed. Wheat should be grazed at the onset of the jointing stage of plant growth when the plants are 12 to 15 inches tall. Greatest pasture yields have been obtained when about three inches of growth remain after each grazing period.

Vegetative Identification

Wheat plants can be distinguished in the vegetative stage from other small grains by the distinctive attachments of their leaves and stems. The principal distinguishing characteristics are the auricles and ligules.

The auricles are the lateral extensions of the leaf collar, which is the thickened, hinge-like part of the leaf serving as a joint between the leaf blade and leaf sheath. Auricles occur in pairs and project around the

Distinguishing Characteristics of Wheat, Barley, and Oats in the Vegetative Stage.



Diagrammatic presentation made from living plants and line drawings by Beecher Crampton of the Agronomy Department University of California, Davis stem. Wheat has short, hairy auricles; barley has long, clasping auricles; and oats have no auricles.

The ligule is an outgrowth from the upper and inner side of the leaf blade where it joins the leaf sheath. Wheat has a longer, more prominent ligule than barley but smaller than in oats. The drawings (page 10) show the differences between the auricles on wheat, barley and oats in the vegetative stage.

Determining Quality Using the Sedimentation Test

The U. S. Department of Agriculture has developed a rapid test to measure the baking quality of wheat. Wheat with good baking quality has gluten which greatly increases in volume when mixed with lactic acid. When the amount and quality of gluten is inferior this is detected by the test.

The procedure for conducting the sedimentation test is given in publications of the U. S. Department of Agriculture.

Seedbed Preparation

Use a minimum number of tillage operations to help prevent soil compaction and restriction of root and water penetration. After the soil has been plowed, prepare for irrigation. When borders are to be used, border ridges must be constructed.

Properly prepared soil should be loose and friable to promote root development and water penetration. The soil should not be worked when too wet or too dry. Usually a light harrowing to a depth of two to three inches, after the soil surface becomes dry and before crusting, will produce a satisfactory seedbed for drilling in moisture.

When wheat follows cotton or sorghum in the rotation, the only seedbed preparation needed may be disking. It is possible for wheat to produce profitable yields with this type of seedbed, but plowing is recommended to improve water penetration and increase yields.

Injury Caused By Monuron or Diuron

Monuron or diuron may be used to control annual weeds in cotton. Under certain conditions, these herbicides cause damage to wheat or other crops which follow.

Wheat, barley, safflower and most other plants growing in soil containing excessive residual monuron or diuron usually emerge normally. After the first irrigaiton, leaves may turn yellow and browning begins at the tips. These injured plants may die or slowly recover.

Wheat or barley plants which appear to be injured as seedlings may produce normal yields of grain. At other times, the yield of grain may be reduced even though there is no visible injury during the seedling stage.

The yellow, stunted plants growing in soil containing residual monuron or diuron often are observed in lengthwise patterns in the field. The width and location of areas containing these injured plants usually will be associated with the cotton planting row arrangement. In some cases, the damaged plant areas correspond with the location of coarser textured soil types.

When wheat or barley follows cotton treated with monuron or diuron, minor isolated damage nearly always occurs at turns, in places where the sprayer did not function properly, or in low areas of the field. Damage of this sort usually is of little significance.

Monuron and diuron appear to move in the soil in about the same way as salt. The possibility of damage to safflower or small grains is greatest for plants on top of the ridges.

Many cases of severe residual monuron or diuron damage can be traced to a premature discontinuance of irrigation on cotton. Trouble often arises when alternate rows of the treated crop are irrigated, when treated skip-row areas are not irrigated, or when the usual number of irrigations at the close of the season is reduced.

Occasionally, in certain areas of the state, heavy rains may occur late in the season. These rains will help to decompose or leach the herbicide.

When land is left fallow without irrigation or rain, very little decomposition of the herbicide will occur. Most damage on the crop which follows can be avoided by using the lowest recommended rate for the soil texture concerned and by properly irrigating the treated crop.

Whenever there is a chance of injury caused by residual monuron or diuron there are several ways to reduce the risk of damage. These are:

1. Plow the soil, using a moldboard plow. This will dilute the herbicide.

2. Pre-irrigate adequately two to five weeks before planting the next crop. This will facilitate microbial action and the decomposition of herbicide.

3. Plant on the flat when possible. There is less risk of injury to plants when they are grown on the flat.

Method of Planting

Two methods of planting are used for wheat in Arizona: (1) planting with a grain drill, and (2) broadcast planting. Drilling or broadcasting of the seed may be done across the borders or lengthwise in the borders. Drilling across the borders helps to smooth the border ridges and makes harvesting less difficult. Also, weed problems are reduced when wheat is planted on the border ridges.

Planting with a grain drill normally gives best results. When a drill is used, the seed is placed at a uniform depth, and less seed is required to obtain a stand. The grain drill should always be used when planting in a moist seedbed. When drilling the seed into moist soil, place the seed one to two inches below the soil surface or below the dry mulch when one exists.

Broadcast planting may be done after the seedbed has been prepared, but before irrigating. This method of planting usually is most satisfactory for early plantings when the soil temperatures are still relatively high.

Following planting, the area should be lightly harrowed to provide seed coverage. When the land is irrigated, surface washing of the soil must be kept at a minimum.

A disadvantage of broadcast planting is that some seed placed near the surface will not have adequate moisture for germination. Also, some seed will be placed very deep, making seedling emergence difficult or impossible.

Date of Planting

There are wide yearly and seasonal variations in climate in each area. During years having long, cool springs, late plantings have produced satisfactory yields.

However, when warm weather comes unseasonably early in the spring, yields obtained from late plantings are usually low. Late frosts may damage early plantings during flowering and seriously reduce grain yields.

Date of planting experiments have been conducted at many locations in the state. Recommendations based upon the results obtained from these tests are given in the table on page 14.

Wheat Variety and Date of Planting Recommendations by Climatic Areas

Area	Sept.	Oct.	Nov.	Dec.
I			Onas 53	Ramona 50 and Onas 53
II			Onas 53	Ramona 50 and Onas 53
III				Ramona 50 and Onas 53
IV*		Turkey Red and Comanche		
V*	Turkey Red and Comanche			

Area	Jan.	Feb.	March	April
I	Ramona 50	Ramona 50		
II	Ramona 50	Ramona 50		
III	Ramona 50	Ramona 50		
IV*			Ramona 50	Ramona 50
V*				Ramona 50

*The recommendations for Areas IV and V should be regarded as suggestions based on limited information. When wheat is to be used for pasture, earlier planting dates than those suggested above should be used. Climatic areas are shown on page two.

Rate of Planting

In wheat rate of planting studies in Arizona, a wide range of planting rates have given similar results. The amount of seed which will give best results will depend upon the date of planting, variety, type of seedbed, soil moisture, irrigation procedure, and climate.

When a grain drill is used for planting, less seed is required than when the seed is broadcast on the soil. A poorly prepared seedbed will require more seed than one that has been well prepared. High planting rates often result in lodged grain and increase harvest difficulty.

When wheat is planted using a drill, 60 to 80 pounds of seed per acre are recommended, except for late plantings. Since late planted grain has a shorter period to tiller, slightly higher planting rates are suggested.

Fertilization

When wheat is used for grain or hay, apply 50 to 100 pounds of elemental nitrogen per acre. Nitrogen may be applied at planting, as an early top dressing or in the irrigation water.

It is essential that there be adequate nitrogen for early seedling growth and development. When wheat is grown for pasture and grain or when wheat follows crops in which large quantities of straw or other organic residues have been plowed under, apply an additional 50 to 75 pounds of nitrogen per acre.

When wheat follows alfalfa or heavily fertilized and shallow-rooted crops such as vegetables, less nitrogen will be required. Wheat yields may be increased by the application of phosphorous where other crops respond to phosphate fertilization. In such cases make an application of 50 to 75 pounds of P_2O_5 per acre at planting time.

Irrigation

Adequate irrigation water, properly applied, is necessary for high yields of wheat. The best time for each irrigation will vary with the soil type and climate of the area of the state where the crop is grown. However, certain irrigation practices apply to all soils, areas and seasons.

The consumptive use of water for wheat is about two acre-feet per acre. However, actual water delivery will be greater and will depend on irrigation efficiency. The total amount of water delivered usually will be between 3 and 3½ acre-feet per acre.

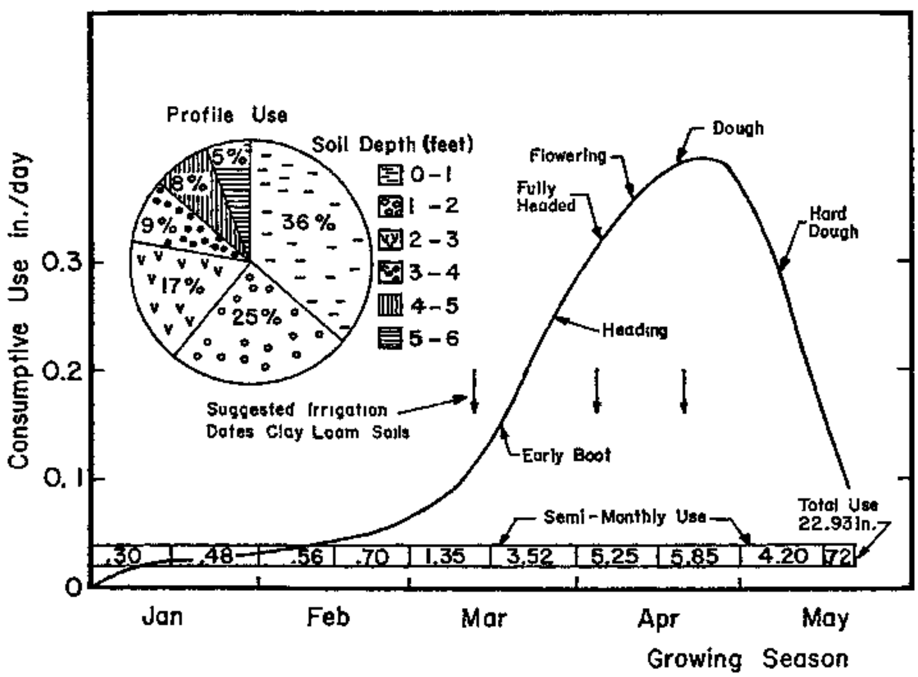
Wheat usually will require four or five irrigations depending upon soil type and other factors. Onas 53 may require one more irrigation than Ramona 50, since it is about 10 days later in maturity.

Water applied for the preplanting or planting date irrigation should be sufficient to wet the soil to a depth of six feet. Usually, at least one foot of water will be required for this irrigation. The actual amount of water needed for the pre-plant irrigation will depend upon the date of planting and the soil type. When the texture of the soil is coarse, a smaller amount of water for this irrigation will be satisfactory.

When proper water penetration is obtained in the preplanting irrigation, the next irrigation usually will be needed just before early boot. Vegetative growth is rapid and water requirement is high at this stage of plant development. Irrigating during the winter months, while the soil is cold, may reduce yield.

The scheduling of irrigations should be based on consumptive

Mean Consumptive Use — Wheat, 1959-1960, Mesa, Arizona



U S Water Conservation Laboratory Tempe Arizona
Research by Leonard J Erie & Orrin F French

use, visual observation of plants, and soil moisture content as determined by use of soil probes. As may be noted in the chart on page 16, 22.93 inches of water were consumptively used by wheat during the growing season. Of this amount, 36 percent was taken from the first foot of soil and 25, 17, 9, 8 and 5 percent from each of the succeeding one-foot increments through six feet.

The final irrigation should be applied at such a time that it will supply sufficient moisture through the dough stage of kernel development. Irrigation after the hard-dough stage may increase lodging and reduce grain yield.

Control of Weeds

When a good stand of wheat is obtained and when proper cultural practices are followed, the crop will compete well with annual weeds. It also competes well with most perennial weeds. This is especially true in Areas I, II, and III (page 2) where wheat grows during the late fall and early spring, when perennial weeds are dormant.

When small grains are planted on the same field for two or more years, weeds such as wild oat may become increasingly troublesome. Wild oat and other similar weed problems are minimized by the use of rotations which include cultivated crops.

When fields are known to have a severe infestation of wild oat it is best not to plant small grain. The amount of wild oat seed in the soil may be reduced by irrigating and pasturing such fields for one or two years.

Recent experiments using herbicides for the control of wild oat in wheat have proven to be very effective. For recommendations concerning the use of such herbicides refer to the current issue of Bulletin A-1, "Chemical Weed Control Recommendations for Irrigated Areas of Arizona."

When wheat is planted at the proper time, weed problems are lessened. Also, weeds are less of a problem when wheat is planted in moist soil under a dry mulch. Planting the entire area, including border ridges when they are used, helps to control weeds. Unplanted ridges become a source of weed seed to contaminate future crops.

It is essential that clean planting seed be used. Certified seed is suggested whenever the recommended varieties are available. When weed or other crop seeds are planted, an additional source of contamination is created. The use of high quality seed is always a sound investment.

The herbicide 2,4-D may be used to control broadleaved weeds in small grain. Recommendations for the use of 2,4-D are given in University of Arizona Bulletin A-1, "Chemical

Weed Control Recommendations for Irrigated Areas of Arizona."

After harvest, wheat fields which lie idle often become weedy. Annual weeds can be controlled by mechanical means. Growth of Johnsongrass and other perennial weeds is reduced when irrigations are terminated soon enough so that the soil will be dry after the grain is harvested.

Any factor which favors the growth of wheat increases its ability to compete with weeds. Thus, proper planting date and rate, fertilization, irrigation, and insect control are all important in an effective weed control program.

Diseases and Insects

There are several diseases and insect pests which may reduce the yield and quality of wheat grain and forage. The use of disease and insect resistant varieties, crop rotations, good cultural practices, proper date of planting, disease-free seed, and seed treatment will help keep losses at a minimum.

Seed treatment with organic mercurials such as Panogen or Ceresan helps to control seed and soil-borne diseases of wheat. When necessary, insecticides may be used in combination with fungicides.

When seed treatment chemicals are improperly used, germination of seed may be adversely affected. It is essential that directions for application as given on the container be carefully followed. Seed which has been treated must not be used for feed or food, since the insecticides and fungicides are poisonous.

Yellow Dwarf

Yellow dwarf symptoms are more easily observed in barley and oats than in wheat. It is caused by a virus which is carried to wheat plants by aphids. Infected wheat plants have a yellowish-brown color.

Stunting is a symptom which usually occurs when plants are infected in the seedling state. Infection at later stages of growth usually results in less dwarfing of the plant. When symptoms are considered separately they may be confused with nutrient deficiencies, residual effect of herbicides, or other unfavorable environmental factors.

Other Diseases

Bunt, sometimes called stinking smut, is easily controlled by seed treatment. Other diseases such as stem and leaf rusts cause severe damage to wheat in other states but have not been serious in Arizona.

Aphids and Other Insects

The English grain aphid is the most commonly occurring aphid in wheat. It attacks the heads and economic damage may occur when populations become high prior to the late-dough stage.

Other insects such as cutworms, darkling beetles, and saltmarsh caterpillars may damage wheat, particularly during the seedling stage.

For the control of insects causing damage to wheat, refer to Bulletin A-14, "Arizona Insect Control Recommendations."

Grain Harvesting and Storage

The entire wheat crop in Arizona is harvested using combines. For safe storage, harvest should begin when the moisture content of the grain has been reduced to 12 to 13 percent. Proper combine adjustment will reduce harvest losses to a minimum.

Storage bins should be carefully cleaned and treated before grain is placed in them. Empty bins may be sprayed with methoxychlor or premium grade malathion. Use a 2.5 percent spray of either material prepared by mixing the wettable powder or emulsifiable concentrate with water. Apply at the rate of two gallons per 1000 square feet of surface area.

During storage, the grain should be observed to detect heating or insect infestations. When insects become a problem they may be controlled by appropriate bin fumigation.

The authors gratefully acknowledge the valuable assistance of the following University of Arizona and U. S. Department of Agriculture personnel: D. F. McAlister, Alvin Allen, G. E. Blackledge, William Brechan, H. A. Brubaker, G. W. Campbell, J. R. Carter, C. E. Edmond, L. J. Erie, E. A. Foster, Jr., O. F. French, R. G. Gray, K. C. Hamilton, E. S. Heathman, C. L. Isaacson, E. B. Jackson, B. C. Kell, W. R. Kneebone, J. H. McClelland, Leon Moore, J. N. McDougal, C. G. Page, R. T. Ramage, H. E. Ray, J. L. Sears, R. K. Thompson, A. H. Underwood.

Part of the information regarding the general characteristics and origin of the wheat varieties discussed in this bulletin was obtained from: (1) United States Department of Agriculture, Technical Bulletin No. 1083, 1954; and (2) California Agricultural Experiment Station and Extension Service, Manual 29, 1961.

The acreage and yield information was obtained from Arizona Crop and Livestock Reporting Service.

Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guaranty or warranty of the product named and does not signify that this product is approved to the exclusion of comparable products.

Contents

This publication is issued by the
Cooperative Extension Service and
the Agricultural Experiment Station
of The University of Arizona. See
your local County Extension Agent
for additional information.