Disease control

While the wheat is growing, farmers must protect it from diseases. Several diseases affect various parts of wheat, including roots, stems, leaves and ears. Leaf diseases occur more frequently in the Western Cape relative to the summer rainfall regions. Only a few are listed. Anthracnose, Aschochyta, Bacterial blight, Rust, Schlerotinia (white mould). The control for these includes crop rotation, use of disease-free seeds or certified seeds, scheduled irrigation, use of resistant cultivars, work in plant debris after harvesting and conservation tillage.

Harvest maturity and methods

Wheat grains must be dry before it can be harvested. Wheat is harvested in November/December, however, but later harvestings are applicable in case of spring and summer wheat. Only fully ripened grains should be harvested. Harvesting should commence at 16 % grain moisture content while lower moisture contents up to 13 % are preferred for storage. The shattering types must be harvested earlier and dried artificially. A machine called a combine harvester is used to cut, separate and clean the grain. A combine harvester must be properly adjusted to minimise grain losses. Special tools were developed for harvesting wheat:

- Reaping: The sickle and scythe are tools that are used to cut and harvest wheat in the past. Mechanical reapers eventually replaced the hand tools.
- Threshing: This is the separating of the grain or seeds from the plant material. The cutting and threshing process is combined in the combine harvester. It could cut wheat, thresh out the grain, and store it in a bin on the machine.
- Winnowing: Is the process of separating threshed grain from the chaff.

Uses

Human uses: The grain can either be eaten whole or ground. Finely ground wheat is the source of flour for the world's bread-making industry.

Industrial use: Grain is a source of alcoholic beverages. Industrial alcohol is made into synthetic rubber and explosives. Starch is used for pastes and sizing textiles. Straw is made into mats, carpets, baskets, and used for packing material, cattle bedding and paper manufacturing.

Animal feed: Bran from flour milling is an important livestock feed, while germ is a valuable addition to feed concentrate. Grain can be fed to livestock whole or coarsely ground. Some wheat is cut for hay. Wheat grown for grain crops is also used for pasture before the stems elongate.

Acknowledgements

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Further information can be obtained from:

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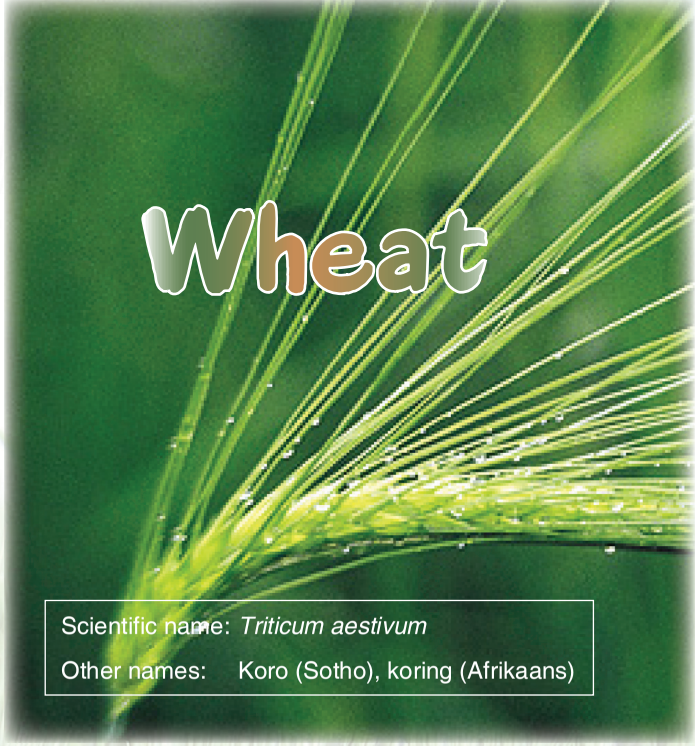

Background

The origin of the wheat is not precisely known. Wheat evolved from wild grasses, probably somewhere in the Near East. A very likely place of origin is the area known in early historical times as the Fertile Crescent—a region with rich soils in the upper reaches of the Tigris-Euphrates drainage basin.

Production areas

Province	District
Free State	Xhariep, Lejweleputswa, Thabo Mofutsanyane, Northern Free State
Western Cape	West Coast, Boland, Overberg, Cape Town
North West	Dr Ruth Segomotsi Mompati, Dr Kenneth Kaunda, Bojanala
Northern Cape	Francis Baard
Mpumalanga	Gert Sibande, Nkangala
Limpopo	Waterberg

agriculture, forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Agronomic requirements

Soil requirements

Wheat grows well in a variety of soils; however, loamy to sandy loam is regarded as ideal for optimum growth. Wheat is adversely affected by acidic soils, which are associated with high aluminium (Al_3+) content, particularly during the early developmental stages of the crop. The soil pH required is 6,0 to 7,5.

Climatic requirements

Wheat is an annual winter and spring cereal crop with a growing season of approximately 130 to 190 days. Winter wheat requires a certain cold exposure (vernalisation) before flowering can take place. Warm temperature ranges from 22 to 34 °C are suitable for spring wheat and cool temperature ranges from 5 to 25 °C are suitable for winter wheat. An ideal climate for planting wheat can be described as cool and moist, followed by a warm, dry season for harvesting. In South Africa wherein most of the country receives summer rainfall, winter wheat production is dependent on sufficient residual soil moisture.

Rainfall

The water requirement for wheat is about 600 mm per annum. In dry areas where cultivation practices such as zero tillage and minimum tillage are practised, stubble mulching is recommended for moisture conservation. Frost can damage wheat especially after the formation of ears in spring resulting in low yield. Hail can also result in serious damage on the summer wheat resulting in low yield. Wet weather during harvesting contributes to disease prevalence and quality deterioration of grains. The moisture application under irrigation should be lowered during flowering, increased during pod filling and cease during ripening.

Cultural practices

Propagation

Wheat is propagated by seeds

Soil preparation

Minimum tillage (75 to 130 mm deep), deep tillage (150 to 300 mm) or no till can be practised depending on the type of the soil, moisture availability, type of cultivar and the previous crop planted. Firm, smooth, well-drained fields should be selected. The field should be free from weeds, stones and waterlogged conditions. Contour ridges, ridges, field waterways, terraces or windbreaks should be introduced to the field to prevent wind and water erosion.

Avoid using a field that was planted to wheat the previous year or same year.

Planting

Planting depth should range from 2 to 5 cm; row spacing of 30 to 90 cm is recommended, depending on available water and planting density of 70 to 90 kg seed/ha^{-1} under dryland and 100 to 150 kg seed/ha^{-1} under irrigation. Planting date for winter wheat is from mid-April to mid-July, depending much on vernalisation effect. The irrigated cultivars are planted from early June to mid-August. Spring wheat is planted from August to September, depending on soil moisture and on warmer day and night temperatures during growth and reproduction. The seed should be planted evenly and shallowly in a moist, firm seedbed. A no-till planter can be used for seeding or a planter fitted with tines can be used for planting.

Fertilisation

Nitrogen fertiliser is applied through broadcasting directly before or during planting, and should be incorporated lightly into the soil. Nitrogen fertiliser should be reduced in case a legume crop is followed by wheat. Excessive fertilisation with nitrogen should be avoided owing to luxuriant vegetative growth with the resultant lodging. It is advised that nitrogen should be applied at planting. Direct contact between seed and fertiliser should be avoided. For irrigated wheat, total of nitrogen can be broadcasted before or at planting on clayey soil (>25 % clay).

Split applications are recommended for sandy soils, but all should be applied before growth stage 10–12 (late tillering) for maximum productivity. Potassium deficiencies are seldom observed in the wheat production areas, as the South African soils are relatively rich in potassium. Potassium deficiencies may occur under the following conditions:

- highly leached sandy soils with low levels of soil potassium
- cold and/or wet and/or very dry conditions
- very high magnesium and/or calcium content of soil.

Fertiliser applications should be based on the recommendation subsequent to soil sampling.

Irrigation

Irrigation scheduling must be according to evaporation and needs, as per growth stage. It is, however, very important that irrigation is not stopped too early and the last irrigation must be applied when the total plant is almost discoloured. This is to ensure an even ripening and to produce grain with a high percentage plumpness and acceptable nitrogen content. Proper irrigation scheduling can also minimise lodging and disease occurrence and optimise yield quality. The method of irrigation will depend on the water availability and the available irrigation equipment.

Weed control

Planting must be done on a clean field. This will avoid unnecessary weed control during early seedling growth. As soon as the crop has covered the soil surface, the chances of weed to develop are minimal. However, any weeds during seedling stage should be eradicated. Weeds can be controlled chemically, mechanically or by any possible means. The main interest being to avoid reduction of yield by weeds since they compete highly with the desired crop for soil nutrients, water and light furthermore serving as carriers for disease and pests. Mechanical control needs to be done judiciously to avoid seedling injuries.

Pest control

Wheat is susceptible to various kinds of pests that feed on the underground and aboveground parts of the plant, negatively affecting the vegetative growth, flowering, pod filling, water and nutrient cycle of the plant. Continuous damage without treatment results in reduced yield or zero yields. Major pests are American bollworm, aphids (green and brown), black maize beetle, black sand mite, false chinch bug and mite. The following cultural control mechanisms can be used; proper crop rotation, biological control, the use of pest resistant cultivars, weed removal, proper soil preparation, inoculation with a cowpea group strain of rhizobium, intercropping and avoid too much moisture or very humid conditions, especially during the flowering or harvesting period.