**Agro-5902, 3(2-1), General Crop Production**

**Wheat (*Triticum aestivum* L.)**

**A) Crop Botany:**

It belongs to family Poaceae.

i) Root: it has fibrous root system that consists of seminal (primary) root and crown roots or adventitious (secondary) roots which develop from nodes just below soil surface.

ii) Stem: hallow cylindrical stem called as culm consisting of nodes and internodes.

iii) Leaves: It has narrow leaves. Each leaf has basal leaf sheath which encircles the stem and upper expanded leaf blade. The upper most leaf is called flag leaf.

iv) Inflorescence: It is called ear or spike which consists of many spikelets with seeds in them. The mode of pollination is self-pollination.

v) Seed: it is called grain or caryopsis. Seed coat is fixed with pericarp (ovary wall).

**B) Agro-meteorology:**

i) Climate: Wheat is adapted to temperate regions from 30-60oN and 27-40oS latitudes which receive annual rainfall of about 500-1200 mm. It is a long day plant and tillering is stimulated by shorter days. About 22-23oC average diurnal temperature (**diurnal temperature**; is the variation between a high **temperature** and a low **temperature** that occurs during the same day) is optimum for germination. Cardinal temperatures for growth are minimum 3-4oC, optimum 18-25oC and maximum 30-32oC. (**Cardinal temperatures** are minimum, **optimum** and maximum **temperature** at which growth of plant is seen).

ii) Soil: It can be grown on sandy-loam to clayey soils. However, silt to clay loam soils are best for it.

**C) Economic Importance:**

It is most important food crop of the world. In Pakistan, it is main staple diet and largest grown crop and contributes 13.1% to the value added in agriculture and 2.8% to GDP. Area of Pakistan under wheat is 8.74 million ha, production 25.2 million tonnes and average yield is 2.88 tonnes / ha.

Uses: Its flour is used to make *chapaati*, bread and other bakery products. Its starch is used in paper and food industry. The byproduct of flour mills (choker) is used for livestock.

**D) Production Technology:**

**1) Seed bed preparation:** 2-3 ploughings, 2 cultivations followed by planking are sufficient to prepare seed bed.

**2) Sowing time:** It is rabi season crop. In barani areas: 20th October – 10th November

In irrigated areas, optimum sowing time is 1st November – 15th November

Sowing after November results in 10-12 kg grain yield reduction per acre per day.

**3) Seed rate:** 40-50 kg / acre (60 kg / acre in case of December sowing). If germination is less than 90%, then seed rate should be increased.

**4) Sowing method:** In barani areas: Line sowing with pora (seed is dropped in rows through pora or nai ( a wooden structure) ,or drill

In irrigated areas: Sowing with automatic rabi drill is best. If drill is not available, then kera (when seed is dropped in furrows by hand, it is called **kera method)**, or seed can be broadcasted but seed rate should be increased by about 5%.

In case of late sowing or saline soils, shallow dry sowing followed by irrigation is the best.

The optimum plant population of wheat is 10-12 lac plants per acre.

**5) Fertilizer:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Areas** | **Rainfall / Fertility** | **N** | **P2O5** | **K2O (kg/acre)** |
| Barani areas | Moderate rainfall | 34 | 23 | 25 |
| High rainfall | 46 | 34 | 25 |
| Irrigated areas | Moderate fertility | 42 | 34 | 25 |
| Low fertility | 52 | 46 | 25 |

Fertilizer should be applied according to fertility status of soil (in irrigated areas) and according to rainfall (in barani areas). Less fertile soils require more fertilizer and more rainfall areas require more fertilizer.

In irrigated areas, whole of P and K should be applied at seed bed preparation. But N is applied in 2 splits, ½ N at seed bed preparation and ½ N with 1st or 2nd irrigation.

**6) Irrigation:** It requires 3-4 irrigations:

**1st irrigation**: 20-25 days after sowing (DAS) at Crown root initiation (CRI) stage (when adventitious root development starts), 30-40 DAS in rice areas.

**2nd irrigation**: 15-45 DAS at tillering (in which secondary shoots arise from the main or primary shoot). Tiller is a shoot having its own root, stem, leaves and inflorescence. First tiller arises 15 Das with a new tiller after every 4-5 days and continues till 45 DAS. Irrigation during this stage enhances tiller development.

**3rd irrigation**: 80-90 DAS at booting stage when spike is developing within flag leaf and near to emergence. Irrigation during this stage enhances spike length and number of tillers per spike.

4th Irrigation: 125-130 DAS during milking stage of grain development. Irrigation during this stage increases grain size and weight.

If sufficient water is not available, then reduce the number of irrigations to 2-3 at the most important critical growth stages i.e. CRI, booting and milking stages.

**E) Plant protection measures:**

**i) Weeds:** 15-20% reduction in yield occurs due to weeds.

Cultural control: 1. *Daab* (delayed planting) is carried out with double rauni irrigation.

2. Crop rotation in which wheat field is sown with another rabi crop in the next season e.g. berseem etc. With it, serious weeds like wild oat or dumbi sitti are controlled.

3. Hoeing or interculturing with bar harrow after 1st or 2nd irrigation.

Chemical control: Pre-emergence herbicides e.g. Stomp or Treflan @ 1.3-2 L /acre for controlling BL weeds and grasses.

Post-emergence herbicides e.g. Buctril Super for BL weeds; Topic, Puma Super for grasses.

**ii) Insect-pests:** Grasshoppers, crickets, aphids, army worms and white ants

Grasshopper and white ants attack at seedling stage and are more serious in rainfed areas.

Aphid, Armyworm attack at heading.

Spray of suitable insecticides is recommended before grain development.

**iii) Diseases:** Stem rust, leaf rust or black rust and stripe rust are serious. In stem rust, brick-red spore-containing postules appear on all parts of plant in patches. In loose smut, floral parts are transformed into black powdery mass.

**9) Harvesting and Storage:** Crop matures when plants start drying and yellowing. In plane areas, areas of Punjab, wheat harvesting starts in mid-April and continues till end May. In hilly areas, wheat is harvested in June and July. Crop is harvested by sickle or by combine harvester or tractor mounted reapers. Combine harvester harvests as well as thresh the crop. After harvesting, the grain must be dried enough for safe storage. Bags, bins and stores must be fumigated to avoid the attack of stored grain pest and rats.

**Varieties:**

**For irrigated areas:** Auqab, 2000, Iqbal 2000, Chenab 2000, MH-97, Durum 97, Punjab 96, Inqilab 91, Pasban 90,

**For Barani (rainfed) areas:** Chakwal 97, Kohistan 97, Chakwal 86, Rawal 87,