Wheat Manual

info@sawie.net
Tel +92 304 5072115
Website: sawie.net
14/4, 3 Gilani Park, Shadab Colony, Ferozepur Road Lahore, Pakistan

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Introduction

- Wheat is a grass cultivated on large scale for its cereals grain which is extensively used as staple food
- The most commonly grown wheat named as *Triticum aestivum* L.
- Wheat covers more land area other than all crops in Pakistan and covers approximately 9.2 million hectares of land (2020-2021)
- Wheat is an important source of carbohydrates. It also contains a portion of proteins

Varieties:

- For the better productivity of crop only clean, healthy and diseased free seed should be used

Varieties for irrigated areas of Punjab:

Variety	Sowing time	Areas for cultivation
Akbar -19	1st Nov – 10th Dec	All irrigated areas of Punjab
Ghazi-19	1st Nov – 10th Dec	
Bhakkar Star	1st Nov – 10th Dec	
Fakahr e bakhar	1st Nov – 20th Nov	
Anaaj 2017	1st Nov – 10th Dec	
Zincol 2016	1st Nov – 10th Dec	
N N Gandam -1	1st Nov – 10th Dec	All irrigated areas of Punjab
Lasani 2008	1st Nov – 10th Dec	

Borlag 2016	1st Nov – 10th Dec	
Ujala 2016	1st Nov – 10th Dec	
Galaxy 2013	1st Nov – 30th Nov	
Aas 2011	1st Nov – 10th Dec	All southern areas of Punjab
Milat 2011	1st Nov – 10th Dec	
Gold 2016	1st Nov – 10th Dec	
Johar 2016	1st Nov – 10th Dec	
Faisalabad 2008	1st Nov – 10th Dec	All irrigated areas of Punjab, As well as for salt affected and areas with limited water supply

Varieties for Rain fed areas of Punjab

Variety	Sowing time	Areas for cultivation
Markaz -19	20th Oct – 15th Nov	All rain fed areas of Punjab
Barani 2017	20th Oct – 15th Nov	
Ihsan 2016	20th Oct – 15th Nov	
Fateh Jang 2016	20th Oct – 15th Nov	
Pakistan 2013	20th Oct – 15th Nov	
Dhrabbi 2011	20th Oct – 15th Nov	
BARS 2009	20th Oct – 15th Nov	

Importance of timely cultivation:

- To take the better production of wheat the appropriate time for cultivation is between 1st of November to 30th of November
- According to the department of agriculture if wheat cultivation is late from 30th of November, yield starts decreasing on daily basis
- Some farmers community cultivate the wheat up to January, but it decreases the yield up and around 50%

Seed Rate:

For irrigated areas: 40 to 50 kg / acre

For rainfed areas: 50 to 55 kg / acre

- Seed germination percentage should not be less than 85 %

Late Cultivation:

- If cultivation is late due to some reasons rate of seed must be increased
- It is so because lower temperature lets the seed to late germination

- So, increasing in seed lets to grow more plants thus increasing yields

Availability of seed:

- Best quality seed is available at Punjab Seed Corporation or at other registered private companies as well

Seed Treatment:

To protect the seed from different diseases like rust, karnal bunt and foot rot seed must be treated with thiophanate methyl (2-2.5 g/kg seed) or imidacloprid along with tebuconazole 2 ml/kg seed.

Land Preparation:

- For better production of wheat land must be proper prepared so, that irrigate the field properly and seepage losses should be minimized
- All the other inputs must be in proper amount to achieve the optimum yield
- Land laser leveler should be used for leveling of land
- Two to three times plough should be applied at different times to control the weeds and proper nutrients distribution
- At field capacity again apply plough followed by planker and repeat again at the time of sowing
- Method of DAAB is useful for timely sowing
- In clayey soils two times plough the soil and in sandy soils just once and followed by planker

Sowing Method:

For sowing in irrigated areas following methods should be followed:

Field capacity method:

- Before harvesting of previous crops 15 - 20 days irrigate the field so at time of harvesting land will be at field capacity
- After harvesting of previous crop two times plough and one-time rotavate the land
- if Rotavator is not available, then deep plough the soil

- After that drill sowing can be done so that seed can be dispersed uniformly and properly grow

Dry Method:

- After harvesting of previous crop two-time plough, the field and one-time rotavate the soil while sowing will be done by drill, then irrigate the field

Broadcast method:

- After harvesting of previous crop two-time plough and heavy planker applied on the land, then irrigate the field. After that, 4-6 hours water-soaked seeds in water should broadcast thoroughly in the field
- This method can also be used for salt affected soils while for hard soils there is no need to soak the seed in water

Sowing after rice:

- Stop irrigation before 15 days of harvesting to achieve the field capacity
- After harvesting at field capacity one-time rotavate followed by two-time disc harrow. After that plough and planker should be given and sowing of wheat can be done
- Sowing of wheat can be done by zero tillage drill or pak seeder if available, so that the sowing can be done timely as well as save cost of soil preparation

Note: *Never burn the residues of the rice to save our environment because smoke of burning residues is injurious for health of human as well as it is hazardous for beneficial microorganism's population*

Bed planting:

- Bed planting is also being adopted now a days
- Inter cropping of other crops can be easily done when ped planting technology is used
- As the crop roots can deeply penetrate thus it prevents crops from lodging
- Heavy irrigation will not stress the plant growth
- It also saves 30-50% water with increased yield thus enhancing water use efficiency

Sowing of wheat between standing cotton crop:

- Wheat sowing between standing cotton crop can save time
- In sandy soil in standing water condition broadcast the seed of wheat twice
- In clayey soil there is no need to soak the seed and according to the situation of the filed capacity broadcast the seed
- Seed should be protected from the pests and birds
- Weed free land is prerequisite for this method of sowing

Following points must also take into consideration:

- Best time so sowing is 10th Nov -25th Nov.
- Seed rate should be 55-60 kg per acre
- Recommended fertilizers should be applied
- Second installment of urea is given at 2nd irrigation
- After 30-40 days of sowing harvest the residues of cotton from root zone at 2-inch depth and throw them outside the field

Method of sowing in rainfed areas:

- After first moonsoon rain mould bold plough or chisel plough should use so that the soil can be deeply pulverized and absorb maximum water
- Before sowing plough followed by planker should be given according to need so that weeds can be eliminated, and water can be stored
- Before sowing ploughing twice followed by planker to maintain the field capacity
- Drill sowing can be an excellent option
- Crop intensity can be increased by sowing barley after harvesting of wheat

Note: *If jantar and barley is sown in June and in August it is incorporated in soil to enhance the fertility of soil*

Method and benefit of drill sowing:

- Depth of seed should be not more than 2 -2.5 inch so that the seed can be uniformly distributed
- By drill sowing seed and fertilizer are applied in root zone for their efficient uptake

Fertilizer recommendations for wheat:

- For better production of wheat fertilizer should applied after the laboratory test of your field soil
- Soil fertility, electrical conductivity, type of soil and availability of water should be checked before recommendation and application of fertilizers
- Cropping pattern is very important to be considered for fertilizer application
- Laboratories are present in all district of Pakistan, so farmers can get the soil samples analyzed. Moreover, Engro and FFC fertilizers labs are providing advisory and test services

For irrigated areas fertilizer recommendations:

Fertility of soil	Nutrient kg/Acre N: P: k	Quantity of fertilizer in bags/acre
Weak soil Organic matter 0.86%, Phosphorus 7 ppm Potash 80 ppm	64: 46: 25	2 bags DAP + 2 bags of urea + 1.5 bag of SOP
Average soils Organic matter 0.86 % to 1.29 %, Phosphorus 7 to 14 ppm, potash 80 to 120 ppm.	54:34:25	1.5 bags of DAP, 1.75 bags of urea, 1 bag SOP
Fertile soil Organic matter more than 1.29 %, Phosphorus more than 14 ppm, Potash more than 180 ppm	46: 30: 25	1.25 bags of DAP, 1.5 bags of urea, 1 bag of SOP

Note: *However, recommending fertilizers overall capability of soil to produce yield should be considered. Expected yield can be considered while calculating fertilizers*

Fertilizer recommendation for rain fed areas:

Annual rainfall	Nutrients kg per acre N: P: K	Fertilizer in bags per acre
Less rainfall Annual rainfall 350 mm	34 23 12	1 bag DAP, I bag urea, 0.5 bag SOP
Medium rainfall Annual rainfall 350 -600 mm	40 28 12	1.25 bag DAP, 1.25 bag of urea and 0.5 bag of SOP
High rainfall More than 600 mm.	48 34 25	1.5 bag DAP, 1.5 bag of urea, and 1 bag of SOP

Zinc and boron use in wheat:

- For wheat use @ 33 % $ZnSO_4$ 6 kg per acre and boric acid @17 % 2.5 kg per acre at the time of sowing to take good yield
- If $ZnSO_4$ used in previous crop, then don't use it again

Green manure:

- Use decomposed manure 8-10 tons per acre or other green manure crops are cultivated and rotavated in that field

Irrigation:

Although it is important to look at the water level in the soil while irrigating the soil and below schedule can be modified accordingly

After cotton, maize and sugarcane:

- 1st irrigation: 20-25 days
- 2nd irrigation: 80-90 days (Spike formation stage)
- 3rd irrigation: 120 -125 days (grain forming and filling stage)

After rice:

- 1st irrigation: 35-40 days
- 2nd irrigation: 80-90 days (Spike formation stage)

- 3rd irrigation: 120 -125 days (grain forming and filling stage)

Weeds:

- Two types of weeds are present in wheat crop. i.e., broad leaf weeds (piyazi, jangli palak, rowari and shahtra) and narrow leaf weeds (dumbi sitti)
- To better control of weeds regularly do hoeing

1- Piyazi

2- Jangli Palak

3- Rowari

4- Shahtra

5- Dumbi sitti

Insect pests of wheat:

It includes:

- Aphid

- Termites
- Cutworm
- Black ant
- Army worm

While most susceptible pest of wheat is aphid

Aphid:

A small bug which feeds by sucking sap from plants. Aphid reproduce rapidly, sometime producing live young without mating, and large number can cause extensive damage to plants.

Management of Aphid:

Insecticides are needed, insecticidal soaps and oils are the best choices for most situations. Oils may include petroleum-based horticultural oils or plant-derived oils such as neem or canola oil. These products kill primarily by smothering the aphid, so thorough coverage of infested foliage is required.

Rodents:

Rodents also attack to wheat crops

Management:

- Fill holes with water and soil
- Use zinc phosphide (1:20)

Diseases of wheat:

Rust:

Yellow rust (Strip rust)

- Yellow powdery strips on the leaves
- Causal organism is ***Puccinia striiformis***

Brown rust (Leaf rust)

- Brown pustules on leaf blade in random scatter distribution

- Causal organism is ***Puccinia triticina***

Stem rust (Black rust)

- Causal organism is ***Puccinia gramins***
- Stem covered with black powder

2- Karnal bunt of wheat or partial bunt (Juzvi kangyari)

- Causal organism is ***Tilletia indica***
- Kernels are infected and partially converted in to fungus
- Infected seeds emit fishy smell
- Trimethylamine is produced due to which smell
- Attack temperature is 16-24 ^{o}C
- It is seed, soil and airborne disease

3- Smut of wheat:

- Its causal organism is ***Ustilago tritici***
- It is a fungal disease
- Affected plant ear converted in to black mass, head out early and no grain formation
- Required only 3 days to destroy whole acre

4- Foot rot:

- Its causal organism is ***Fusarium Species***

- It is a fungal disease
- In this root are affected with dark brown lesion
- Two attacks in season (Early and later: Feb and March)
- In this grain and spikes remain small

5- Powdery mildew:

- Its causal organism is ***Erysiphe graminis***
- It appears white powder on upper side of leaf
- It reduces photosynthesis and increases respiration in host leaves
- Lower side of leaf converted into brown
- It is a fungal disease
- Infected plant loses vigor, impairing head and grain filling

6- Ear cockle disease:

- Its causal organism is ***Angnuia tritici***
- It is a nematode disease
- It causes yellow and D shape of plants

Harvesting and storage:

- Harvesting stage comes when normally the plant turns golden yellow and becomes brittle. The grains become hard and the straw turns dry
- Harvesting can be done manually or as well as by combine harvesters. Moisture content for storage of wheat should be 10 %