Rice Manual

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Introduction

- Locally known as Chawal
- 2nd most widely grown cereals in the world
- The rough rice (grain with hull) obtained after threshing also called as paddy
- The polishing rice is known as a white or milled rice.
- 2nd major staple food in Pakistan
- Broken rice is major ingredient of poultry feed
- Straw is used in packing the material, sleeping mates' baskets.
- Broken rice used manufacturing of alcoholic drinks

Varieties of rice:

RICE			
Basmati varieties	**Coarse**	**Non-Basmati**	**Hybrid Basmati**
Kissan Basmati	IRI 6	PK 386	KSK 111
Shahen Basmati	KS 282		
Super Gold	KSK 133		
Super Basmati 2019	NIAB IRI 9		
Super Basmati	NIAB 2013		

Sr No.	Varieties	Seed rate kg per acre	Seed rate kg per acre	Seed rate kg per acre	Nursery sowing and transplantation	
		Wet method	Dry method	Raab method	Time of sowing	Time of transplantation
1	Coarse	6 to 7	8 to 10	12 to 15	20 May to 7 June	20 June to 7 July
2	Basmati Type	4.5 to 5	6 to 7	10 to 12	7 to 25 June	7 to 25 July
3	Non-Basmati	4.5 to 5	6 to 7	10 to 12	7 to 25 June	7 to 25 July
4	Basmati Hybrid	4.5 to 5	6 to 7	10 to 12	7 to 25 June	7 to 25 July

Super Basmati 515	KSK 434
Chenab Basmati	NIBG SR 6
Punjab Basmati	
PK 1121Aromatic	
NIAB Basmati 2016	
Noor Basmati	
PK 2021	

- Germination percentage of seed should be 80 %

- According to the **Punjab Agriculture pest ordinance 1959 restricted to grow rice nursery till 20 MAY due to rice stem borer (March – April)**
- Basmati seed germination should be 80 %
- Hybrid seed germination should be 70 %
- Previous year rice stubble should be removed before 28th Feb

Note: In case of less germination percentage seed rate may be enhanced accordingly

Land preparation and method of sowing:

Rice can be cultivated on most of the soils however should be avoided on sandy soils. By adopting proper management practices, it can be cultivated on salt-affected soils as well

Method of nursery plantation:

Wet method:

- Seed should soak for 24 hours in water after fumigating it
- After that put it on the floor
- Cover it with wet bags until seeds will sprout out
- After 36 – 48 hours seed will be ready for sowing

Land preparation and broadcasting of seed:

- One to two times do dry plough and irrigate the field
- In standing water apply double time plough and just once planker
- Herbicides can be used to control weeds
- Broadcast the seed ready for sowing
- During broadcasting 1-1.5-inch water should be present in the field
- Seed broadcasting should be in the dusk and after that dusk water should be removed and next morning again irrigate the field, so that the seed cannot be rotten
- This should be done up to one week
- By this method nursery can be prepared within 25 – 30 days
- If nursery is week, then broadcast nitrogen fertilizer

Dry method:

- This method is for those areas where soil is loamy and it can't retain water
- So, irrigate the field and then plough is done followed by Planker
- Before sowing of nursery dual plough and after that planker should be applied
- Dry seed IRRI 1.5 kg per marla and basmati type 750 gm per marla should be used
- Mulching should be done on it to conserve moisture
- Nursery will be ready in 35-40 days

Raab method:

- This method is used in D.G Khan and Muzaffargarh where soils are hard
- After initial land preparation do green manuring
- For IRRI type 2 kg per marla and for basmati type use 1 kg per marla will be broadcast and then irrigate the field
- Within 35 - 40 days nursery will be ready

Elimination of harmful insects in nursery:

- Previous crop residues must be eradicated before 28 Feb
- Never cultivate nursery before 20th May
- Rice grass hopper attacks a lot on nursery, therefore, it is necessary to clean ridges and water channels. If 2 insects per net present, then spray chemicals

Preparation of land for transplantation of nursery:

- The areas where water can't stay in the field, dry method is recommended
- Wetting the field is done to eradicate the weeds and to fulfil the need of water
- Dry plough should do on time to prepare better land
- Established standing water conditions for 10 to 15 days for better quality and production
- While in case of severe water deficiency maintain the water level for 7 days or at least for 3 days
- Use plough along with planker and prepare the land
- Use soil mixer in fertile soil to increase more yield
- In salt affected soil don't plough the field in wet conditions because due to this salt couldn't leach down

Nursery transplantation:

- Nursery by wet method can be prepared in 25 - 30 days and by dry method it can be prepared in 35 - 40 days
- If age of nursery is less than 25 days, then seedlings couldn't tolerate the high temperature
- If more than 40 days, the tillering will be affected
- Before plucking of nursery, irrigate the field so that plants can be easily placed in.
- Water depth should be 1-1.5 inch which can be increased to 3 inch after few days
- Plant to plant distance is 9 inch and in every hole 2 plants are transplanted
- Number of holes are 80000 per acre.
- Gap filling should be done within 10 days

Weeds:

1. Grassy weeds
2. Della family weeds
3. Broad leaf weeds

Grassy weeds:

- Long and sharped edges weeds
- Long stem with nodes

Eragrostis japonica (Bansi ghaas)

Echinochloa colona (Swanki Ghaas)

Echinochloa crusgalli (Dhudhan)

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Cynodon dactylon (Khabal ghaas)

Paspalum distichum (Narro)

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Liptochloa Chinensis (Kalar Ghas or Lamb Ghas)

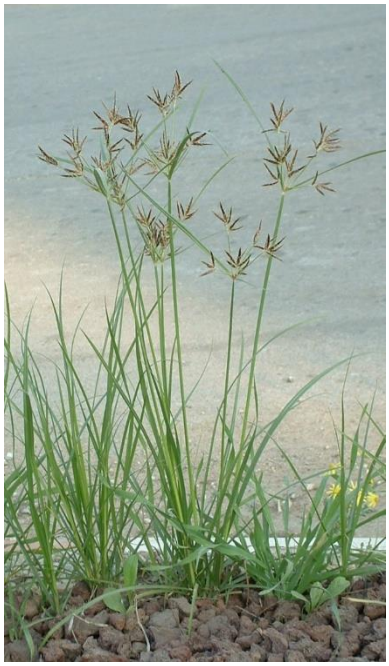
Della family weeds:

- Long, sharp edged round leaves, 3-sided stem

Cyperus difformus (Ghooin)

Cyperus iria (Bhooin)

Cyperus rotundus (Della)



Broad leaf weeds:

Nymphea stellata (kutta kumi)

Sphenoclea zeylanica (Mirch booti)

Marsilea minuta (Chopatti)

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Eclipta prostata (Daryai Booti)

Fertilizer recommendations for rice:

Type	Nutrients kg per acre	Bags per acre (at sowing)	Bags per acre (after sowing)
	N: P: K		
Coarse type	69 41 32	1.75 bags DAP, 0.75 bags urea and 1.25 bags SOP	1.5 bags urea 30-35 days after transplanting
Basmati type	57 32 25	1.5 bag DAP, 0.5 bag urea, 1 bag SOP	0.5 bag 25 days after transplanting and 0.75 50 days after transplanting

Use of Zinc and Boron:

- Five kg 33% zinc sulfate after 15 days of rice nursery grown per acre
- Before transplantation of rice nursery, dip the roots in 2% solution of zinc oxide solution
- Three) kg Boric Acid or Borax (20%) 4.5 kg per acre

Direct Cultivation of rice:

Preparation of soil:

- For best preparation of land in 3rd week of May plough the field twice, then irrigate the field. At field capacity again plough the field

Varieties:

- Except Kissan basmati all the varieties can be cultivated by this method

Seed rate:

- Use 8 - 10 kg seed for basmati and non-basmati and for coarse type use 10 - 12 kg per acre
- Always fumigate the seed according to the instructions

Time of sowing:

- For coarse types best time 20th May to 7th June
- For basmati types best time is 7th to 25th June

Method of sowing:

Through drill machine:

- Dry seed must be cultivated through drill
- Row to row distance in 9 inch and depth of seed should be 1.5 inch
- Check regularly the seed is uniformly distributed in the soil
- Phosphorus and potash fertilizer can be added with the help of drill
- After sowing make bunds in field and irrigate it

Broadcast method:

- If drill is not present sow the seed by broadcast method
- Ploughing should be not below 1 inch
- Broadcast the seed and after that apply planker on the field in same direction
- If sowing is to be done at field capacity, sow with drill or broadcast and after that apply planker
- After some days when tillers emerged out irrigate the field

Eradication of weeds:

- Eradicate the weeds before sowing with the help of plough
- If weeds are not controlled, then use a chemical method to control weeds.
- One-time chemical spray is enough

Irrigation:

- Proper preparation of land is basic requirement for the better utilization of irrigation water.
- 1st irrigation after 5 to 7 days of sowing
- 2nd Irrigation after germination within 30 days
- Never dry the field at grain filling stage
- Before harvesting stop irrigation before 15 - 18 days

Sowing with machine and its benefits:

- Timely transplantation can be done with machine
- Achievement of proper population achieved and growth of plants also increased
- Economically favorable
- Cost of production can be decreased
- Increase yield and nourishment

Key plan for machine sowing:

- Levelling of land
- Nursery plantation in plastic trays
- Reduce quantity of water during transplantation
- Proper trained operator is needed

Raising of nursery in plastic trays.

- For 1acre nursery 100-120 trays are needed
- For this 8-10 kg per acre seed is needed
- Always fumigate the seed
- Land must be prepared well
- Fertile soil should be used in the trays
- If nursery is small use1.5 kg urea fertilizer.
- Use insecticides as per need
- In 25-30 days, nursery will be ready
- Uproot the seedlings from the trays before 12 hours of transplantation so that it dried out and cannot affect the calibration of machine by soil

Transplantation of nursery through transplantation:

- Calibrate the machine before use
- Levelled the land with laser leveler before transplantation
- One-inch water is maintained in the field at time of transplantation with uniformity.
- Stop transplantation when machine is taking turn
- Two (2) cm layer of soil is enough with nursery roots
- Gap can be filled manually
- Recommended fertilizers should be applied
- Row to row distance should be 12 inch and plant to plant distance should be 6 inches

Diseases of rice:

Brown leaf spot:

- It's a fungal disease
- Its causal organisms are *Bipolaris oryzae* and *Helmenthosporium oryzae*
- This disease causes Bengal famine in 1943
- Small circular to oval reddish spot appears on leaves and infects the grain
- Its proliferation increased when soils are potash deficit

Bacterial blight:

- It is a bacterial disease
- Its causal organism is *Xanthomonas oryzae*
- It attacks in patches
- Spread from leaf to stem
- Straw turned yellow to white
- Staining starts from tip to base
- White strips appear on leaves
- Photosynthetic activity is reduced

Rice blast:

- It's a fungal disease
- Its causal organism is *Pyricularia oryzae*
- It causes greyish brownish lesions and eye shaped appearance
- It causes gridling of neck and grains fall over
- Discoloration of grains and turn in black color
- Poor quality grains are formed
- Lesions on the panicle branches, spikes and spikelets

Bakaini:

- It's a fungal and seed borne disease
- Its causal organism is *Fusarium moniliforme*
- It spread due to plant debris
- Rotting of stem, discoloration and root growth is affected
- Proliferation of white and pink fungus

Stem rot:

- It's a fungal disease.
- Its causal organism is *Sclerotium oryzae*
- It appears after panicle formation
- Irregular black spots appear on leaf sheath and destroy the whole stem due to black sclerotia

Sheath blight:

- Its causal organism is *Rhizoctonia solani*
- Generally, appears at tillering stage leads to Irregular long lesions on leaf sheath
- Effect on all parts of crop
- Centre of lesion bleached with an irregular purple brown border

Insect pests of rice:

White stem borer:

- The larval feeding damage may cause death of the central leaf whorl at the vegetative stage which is known as dead heart

Attacking time: November

- Damage the reproductive stages producing ear devoid of grain which is known as white head
- Tiny holes on the stem and tillers appeared
- Fras or fecal matters inside the damage stems present

Management of borers:

- Destruction of rice stubble before February
- Sow nursery after 20th may
- Catch and kill moth with light traps
- Destroy egg of borers
- Balance use of fertilizers.
- Regular pest scouting to locate hot spots
- Use recommended pesticides

Leaf folder:

Mode of damage:

- Its attacking time is July to October.
- Seedlings and young plants are attacked, and 3-4 leave of adjacent plant are webbed together forming longitudinal folds and feed on green matter
- Infested leaves appear white and leaf fold filled with excreta
- It prevents the photosynthetic activity of the plants.

Management:

- Balance use of fertilizers
- Regular pest scouting to locate hot spots
- Light trapping of adults
- Elimination of alternate host plants
- Encourage predators such as spiders and wasps
- Use recommended pesticides especially copper based

White backed plant hopper:

Mode of damage:

- Both nymph and adult damage the plants by sucking phloem sap
- Reduced vigor, stunting, yellowing, delayed tillering and grain formation
- At later stages crop dries up in patches known as hopper burn

Management:

- Grow resistant varieties
- Balance use of fertilizers
- Pest scouting
- Rotate rice with other crops
- Dry the field to reduce population of insects

Rice hispa:

Mode of damage:

- Adults feed on chlorophyll by scrapping the green matter and causing white parallel streaks on the leaves or straight white lines on the leaf surface
- White patches along the long axis of the leaf
- Grubs causes white blotches near leaf tips and finally dry up

Management:

- Avoid over fertilization
- Close plant spacing results in higher plant densities so tolerate greater hispa numbers
- Shoots of the tips cut to prevent egg laying
- Encourage predators

Rice grass hopper:

Mode of damage:

- Both adult and nymph cause damage causing defoliation

Management:

- Eradicate alternate host plants
- Cleaning the field borers before and during the crop
- Don’t sow nursery near maize and sugarcane crop
- Use of dust formulations

Harvesting and storage of rice:

- Normally the appropriate harvesting time ranges from 30-35 days after flowering when 85-95% panicle becomes straw
- Keep the harvested crop 2-3 days for drying before threshing
- Do not harvest seed crop with combines to avoid admixture
- Harvesting time moisture percentage should be 20-22 %
- Storage time moisture percentage should be 12-13 %

Key points:

- Previous crop residues must be eradicated before 28th Feb
- Never sow rice nursery before 20th May
- Green manuring of crop should be done to increase soil fertility
- Always sow approved varieties
- Protect the seed from attack so fumigation should be done
- Plants population should be 160000
- Recommended fertilizers should be used
- In case of zinc deficiency, 33% or 21% $ZnSO_4$ @ 5 and 8 kg Ac^{-1} should be used.
- In case of boron deficiency Boric acid @ 3 kg Ac^{-1} should be added
- Herbicides should be used within 3-5 days after transplantation
- Always use recommended pesticides, fungicides and herbicides
- Pest scouting must be done during the whole duration of crop
- Rice combine harvester should be used to harvest rice
- If it is not available combine harvester should be used in which calibration for rice is present
- For storage moisture must be 12 - 13 %
- Don’t burn the rice straw

- Always use rice straw chopper such as kubota harvester for residues and then incorporate into to the field to increase fertility