

Groundnut



Peanut/Earthnut/Monkey nut/Mungfalli

Botanical name	<i>Arachis hypogea</i>
Family	Leguminosae
Origin	Brazil in south America
Chromosome no	2n= 40

- ✓ **Arachis hypogea fastigiata (Bunch/ Spanish/ Erect type)**
- ✓ **It is also known as Peanut/Earthnut/Monkey nut/ Mungfalli**
- ***Arachis hypogea* word is derived from two Greek words:**
- ✓ ***Arachis* means Legume**

Groundnut

- ✓ **Hypogea** means Below the ground or soil
- ✓ Groundnut is a self-pollinated and day neutral plant.
- ✓ Groundnut is a **modified fruit**.
- ✓ Fruit of groundnut is **Nut and fruit type is Lomentum**.
- ✓ **Gynophore** of groundnut is known as **Peg** (intercalary meristem from fertilized flower).
- ✓ Flowering starts 24 to 40 days after sowing.
- ✓ Pegs become viable in 5-7 days after flowering and takes 2-10 days to insert into the soil.
- ✓ **Testa** is a thin skin that covers the seed or nut.
- ✓ Ratio of Flower: Pegs: Pods is **7:4:1**.
- ✓ The protein and oil content in groundnut seeds are 25 and 45 per cent, respectively.
- ✓ Groundnut cake contains **7-8 per cent nitrogen**
- ✓ Shelling percentage of groundnut is **70 per cent**.
- ✓ Technology Mission on Pulses and Oilseeds (**TEMPO**) was started in 1986
- ✓ Most suitable soil for groundnut cultivation is **sandy to sandy loam soil**.
- ✓ Clay soil is strictly avoided to grow groundnut because of presence of high moisture.
- ✓ The effects are:

Groundnut

- Gynophores are swelled & shrinkage and quality affected.
- Pod growth is affected due to soil compaction.
- ✓ Hypogeal type of germination founds in groundnut
- ✓ Groundnut contains **45 % oil** in kernel **and 26 % protein** in kernel.

• Sowing time:

- ✓ Kharif: 3rd week of June to 1st week of July
- ✓ Rabi: November
- ✓ Summer: Last week of December to end of January

• Seed rate:

- ✓ Bunch type varieties: 100-120 kg/ha
- ✓ Spreading type varieties: 80-100 kg/ha

• Spacing:

- ✓ Bunch type: **60 x 20 cm.**
- ✓ Spreading type: **45 x 15 cm.**

Groundnut

- **Critical stages of crop growth:**

- ✓ 1. Establishment (10-20 DAS)
- ✓ 2. Vegetative phase (25-35 DAS)
- ✓ 3. Flowering and peg initiation stage (35-50 DAS)
- ✓ 4. **Pod formation stage** (50-75 DAS)
- ✓ 3. Pod/Seed development stage (75-90 DAS)

- **Critical stages for irrigation:**

- ✓ 1. **Flowering stage**
- ✓ 2. **Pegging stage**
- ✓ 3. **Pod formation stage**
- **Check basin irrigation** is most suitable irrigation method for groundnut.
- **IW/CPE ratio** of groundnut is **0.6**.
- ✓ During pod development stage, field should be well drained, otherwise due to the poor aeration, the formation of toxin (Aflatoxin) take place.
- ✓ Application of 25:60:60 kg N PK/ha with 25 to 50 kg ZnSO₄ and FeSO₄ both give higher yield of groundnut.
- ✓ Intercultural operations should be avoided during Pegging stage.

Groundnut

✓ **Star weeder** is used to control weeds in groundnut fields.

Comparison Between Bunch type and Spreading type Groundnut		
Particular	Bunch Type	Spreading Type
1. Shelling per cent	: 75 per cent (more)	65 per cent
2. Dormancy occurrence	: No (90% germination)	Occurs (80% germination)
3. Spacing	: 60cm×20 cm	45cm×15 cm
4. Maturity	: Early maturing	Late maturing
5. Seed rate (kg/ha)	: 100-120	80-100
6. Varieties	: Jyoti, Kishan, TMV-11, 12 AK-12, 24, Junagarh-11 ICGS-1, 10, 11, 44 JL-24	Chandra, Type-28, 64 TMV-1, 3, M- 13, 37 Vikram, Verginia, Ganga- puri, Godheri-2, 3
7. Yield (qt/ha)	: 15-20	20-30 (comparatively more)

✓ NAA @ 40 ppm is used to enhance floral initiation and pod formation.

✓ Calcium (Ca) is essential for pod development.

✓ **Earthing-up** is done in groundnut crop at 35 to 45 days after sowing to facilitate proper development of pegs beneath soil and increases number of seeds per pod.

✓ Strain used for biological N₂ fixation in groundnut is ***Rhizobium japonicum***.

✓ Groundnut should be stored at 5 per cent moisture content.

• Bitterness of kernel is due to **Aflatoxin** (toxic substance) developed by two reasons:

➤ When pod moisture content is > **8 per cent**

Groundnut

- Fungus namely *Aspergillus niger* and, *Aspergillus flavus*.
- ✓ Resistant varieties against Aflatoxin are CGC-2, 7 and Faizpur.
- ✓ Vector of virus in groundnut is Aphid.
- Tikka/Leaf spot disease is caused by fungus:
 - Early leaf spot – *cercospora arachidicola*
 - Late leaf spot – *cercospora personata*
- ✓ Major pest of groundnut is **White grub**.

- **Disease-**

- ✓ Early leaf spot:-*Cercospora arachidicola*
- ✓ Late leaf spot:-*Cercospora personatum*
- ✓ Rust:-*Puccinia arachidis*
- ✓ Stem rot:-*Sclerotium rolfsii*

- **Insects-**

- ✓ White grubs:- *holotrichia consanguinea*
- ✓ Aphids:-*Aphis craccivora*
- ✓ Groundnut bud borer:- *anarsia ephippias*
- ✓ Pod borer:- *Anisolabis stali*

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✓ Pod bug:-*Aphanus sordidus*

✓ Groundnut leaf miner:- *Aproaerema Modicella*





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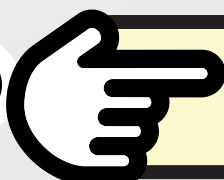
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Cereals crop Rice



Rice

➤ Botanical name	➤ <i>Oryza sativa</i>
• Family	➤ Gramineae
• Chromosome no	➤ 2n= 24
• Origin	➤ South East Asia
• Rice stem is called	➤ Culm.
• Mat type nursery is related to	➤ Paddy
• The rice inflorescence known as.	➤ Panicle
• Fruit type is	➤ Caryopsis
• Germination type	➤ Hypogeal
• Hulling percent in rice is	➤ 66% or 2/3 of paddy
• Seed multiplication ratio for paddy is	➤ For varieties- 1:80 ➤ For hybrid- 1:100
• Test weight (wt. of 1000 grains) is	➤ 25g
• Test weight of Basmati Rice is	➤ 21g
• Test weight	➤ Weight of 1000 seeds of a crop.
• Seed Index	➤ Weight of 100 seeds of a crop (used for bold seeded).
• Hull	➤ Lemma + Palea together
• White eye of rice is due to	➤ Fe deficiency
• Akiochi disease in rice due to	➤ Hydrogen sulphide toxicity.
• Miracle rice in India is	➤ Jaya
• Gene responsible for	➤ Dee-gee-woo-gene.

Cereals crop Rice

dwarfness in rice	
• Reclamation disease of cereals is due to	➤ Cu deficiency.
• Khaira disease of rice is due to –	➤ Zn deficiency
• The gas emit from rice field is	➤ Methane
• Most prominent cropping pattern of rice in India is	➤ Rice-Wheat.

- Rice is self-pollinated and short-day plant.
- **Plumule** is covered by **coleoptile** and **Radicle** by **coleorhiza** in embryo.
- **Paira & Utera cropping** system is closely related to – **Rice**
- Area required for seedling preparation in **Dapog method** – **25-30 m²**
- De-husked (un-husked) rice is also known as **Brown rice**.
- **Hulling per cent** of rice is **70-75 per cent**.
- **Milling percentage** of rice is **50-55 per cent**.
- **Harvest Index** of rice is **0.40 or 40%**
- Rice (cleaned) is **2/3 of paddy**.
- Paira and Utera cropping system are most practiced in Odisha, Bihar and Chhattisgarh.
- Rice prefer nitrogen uptake in **Ammoniacal form (NH₄)**.

Cereals crop Rice

- Best fertilizer as basal dose is **DAP followed by SSP**.
- Ammonium sulphate is the best fertilizer for top dressing in rice.
- The recommended dose of N, P and K for rice crop is **100, 60 and 40 kg ha⁻¹**

Classification:

- Genus ***Oryza*** have **24** species out of which two are cultivated.
- ❖ ***Oryza sativa***, Diploid, **2n=24**, it has three main geographic races.
 - **Indica Rice**- It is tropical rice, grown in India, awn less or short awn, late in maturity, long stem.
 - **Japonica: Temperate or sub-tropical rice**, grown in **Japan**, early maturity, photosynthetically very active, short stem, very **responsive to nitrogenous fertilizer**, **No lodging**.
 - **Javanica/Balu rice - Wild form of rice**, grown in **Indonesia** & have many awns.
- ❖ ***Oryza glaberrima***: It is grown in **West Africa** only

Cereals crop Rice

Climatic Conditions required for rice cultivation

- ✓ **Temperature Requirement**- The average temperature required throughout the life period of the crop ranges from **21 to 37° C**.
- ✓ Temperature requirement for **blooming** is in the range of **26.5 to 29.50 °C**.
- ✓ At the time of **ripening**, the temperature should be between **20-25° C**. Photo-periodically, **rice is a short-day plant**. However, there are varieties which are non-sensitive to photoperiodic conditions.
- ✓ Rice needs ***hot and humid climate***.
- ✓ Minimum temperature for **germination, flowering and grain formation** is **10, 23 and 20-21°C**, respectively.
- ✓ **Optimum temperature** for **growth, flowering and grain formation** is **21-36, 25-29 and 20-25° C**, respectively.
- ✓ **Cardinal temperature: 30-32° C**
- ✓ **Maximum temperature** for which rice crop tolerate is **40°C**.
- ✓ Requirement of rainfall throughout growth period is **100-150 cm**.
- ✓ Rice is a **self –pollinated crop** and short-day plant
- ✓ In general cereal crops required about **400-500 litres** of water for the production of one kg of plant dry matter. But

Cereals crop Rice

rice consumed ten times more water **i.e. 5000** litres of water to produced **1 kg rice grain**.

- ✓ Rice is semi aquatic plant grown best under **submerged condition**, under these conditions the atmosphere oxygen is transported by **Aerenchymatous tissues of leaves**
- ✓ Rice field **submergence in 5 cm deep water** during the reproductive and grain formation stages is beneficial. Rice grain relatively rich in **lysine protein** which is 4 % of total protein fraction.
- ✓ The main **protein in rice** is: **Oryzenin**

❖SOIL REQUIREMENT

- ✓ **Clay or clay loams** are most suited for rice cultivation, such soils are capable of holding water for long and sustain crop.
- ✓ Rice being a **semi-aquatic crop** grows best **under submerged conditions**
- ✓ It grows well in soils having an optimum pH range between **4-6**.

Nursery area required for transplanting in 1 ha (10000 m²):

- Normally: **1000 m² (1:10)**
- Rice dry bed: **1000 m²**
- Rice wet bed: **1250-1500 m²**

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- SRI method: **100 m² (1:100)**
- Dapog method: **40 m² (1:250)**

Transplanting

Rice plant is transplanted at:

1. In Kharif season:	21-25 days after sowing (3-4 leaf stage)
2. In Rabi season	30-35 days after sowing
3. SRI method	10-12 DAS
4. Dapog method	11-14 DAS
5. Dry land areas	30-35 DAS

- ✓ Depending on duration of the variety, **25-30 day old seedling of rice should be transplanted.**
- ✓ Before transplanting, roots of seedlings may be dipped in suspension of *Pseudomonas fluorescens* (@5 g/l).

Spacing-

- ✓ Under good management and adequate nitrogen levels, the optimum spacing should be around **20 x 10 cm².**
- ✓ With excellent cultural practices, the spacing may be slightly wider, say **20 x 15 cm²** but under sub-normal conditions, the spacing should be slightly narrower i.e. **15 x 10 cm².**
- ✓ Planting geometry of **15 × 15 cm.** (row to row × hill to hill) to be maintained in organic rice cultivation so that 1

Cereals crop Rice

m² area has about 50 hills. Square geometry has smothering effect on weeds.

- ✓ **Number of Seedlings per Hill:** Transplanting **two to three seedlings per hill** under normal conditions is enough.
- ✓ **Depth of Planting and Directions of Rows:** The tiller buds formed at the basal node are not suppressed in case of shallow plantings.
- ✓ Therefore, the seedlings should be transplanted at 2 to 3 cm depth.

Sowing time-

SEASON	SOWING TIME	HARVEST TIME
Aus.	April-May	Sept-Oct
Aman	June-July	Nov-Dec
Boro	Nov-Dec	March-April

Agrilearner

Varieties:

- ✓ First dwarf variety of rice developed in world is **TN / in Taiwan in 1964-65.**
- ✓ **First high yielding dwarf variety** developed in world is **IR-8**, by cross between **Dee -Gee -Woo -Gen x Peta.**
- ✓ It was the first known variety to be released by (IRRI) International Rice Research Institute in **1966.**

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- ✓ **Dee-gee-woo-gen** is gene responsible for **dwarfing** in rice.
- ✓ Literally meaning of **Dee-gee-woo-gen** is: **Brown tipped short legged**.
- ✓ **In 1964**, the introduction of **Taichung Native 1** (TN-1) in India signalled a new era in the improvement of rice yield.
- ✓ It was followed by the **introduction of IR 8** in India from the IRRI, Manila (Philippines) **in 1965**.
- ✓ First Indian high yielding earliest semi -dwarf variety **Jaya** released in **1968**, evolved by **Dr. Shastry**, and it's a cross between **TN -I x Type 141**. It's out yielded **TN -1 & IR-8 both; hence called 'Miracle rice in India'**.
- ✓ **Cuttack (Odisha)** evolved two varieties: **Malinga & Mahsuri**
- ✓ Mutant variety of rice: **Jaganath and Sattari**.
- ✓ Variety suitable for direct **seeding: Bala**
- ✓ BLB (bacterial leaf blight) tolerant: **TKM-6**
- ✓ Salinity tolerant: **IR-8, Lunishree**
- ✓ Suitable for waterlogged *area*: **Jalmagna**
- ✓ First hybrid of basmati **in world: PRH-10**.
- ✓ First hybrid of rice in India is: **CORH-1 (1994)**
- ✓ **Pusa Basmati-1: Its world's first high yielding dwarf variety under quality rice has been developed by**

Cereals crop Rice

IARI through convergent breeding.

Seed rate:

Broadcasting	100 kg/ha
Drilling	60 kg/ha
Hybrid Rice	15 kg/ha
Dapog Method	1.5-3 kg/m ²
SRI Method	5-6 kg/ha
Late sowing	125 kg/ha (25% Extra seed)

R*P distance = 20*10 cm

Methods of Rice Cultivation

1. Dry or Semi-dry upland cultivation:

- (a) Broadcasting the seed
- (b) Sowing the seed behind the plough or drilling.

2. Wet or lowland cultivation:

- (a) Transplanting in puddled fields.
- (b) Broadcasting sprouted seeds in puddled fields

Methods of Raising Rice Seedlings

WET SYSTEM

The wet system is also known as **Irrigated rice**. In this system, the crop is grown under wet (irrigated) conditions from seed to seed.

The field is brought to a soft puddle by repeated ploughings **with 5-7 cm standing water**.

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This irrigated rice contributes to **55 per cent** of the total rice production.

METHODS FOLLOWED IN WET SYSTEM ARE

SYSTEM OF RICE INTENSIFICATION

TRANSPLANTED PUDDLED LOWLAND RICE

DIRECT WET SEEDED PUDDLED LOWLAND RICE

1-System of Rice Intensification (SRI)

System of Rice Intensification (SRI) is a methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients particularly by eliciting greater root growth.

SRI method important points-

Only 5-6 kg of seed is required to plant 1 ha.

Nursery area is reduced to 100m² / ha

10-12 days old seedlings are transplanted

5-6 kg / ha for single seedling per hill

Fewer plants per unit area by maintaining space of **(25 x 25 cm)**, here Square planting at 25 x 25 cm ensures optimum space for efficient utilization of resources.

SRI is initially labour intensive which needs 50% more man-days for transplanting and weeding

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Crops	Spacing (cm)	Plant population/ha
Rice: (a) Transplanting	: 20×10	5, 00,000
(b) Hybrid rice	: 20×15	3,33,333
(c) SRI method	: 25×25	1,16,000

2-TRANSPLANTED PUDDLED LOWLAND RICE

➤ Nursery area

- Select 20 cents (800 m²) of land area near to water source for raising seedlings for one hectare.

➤ Seed rate

- 30 kg for long duration
- 40 kg for medium duration
- 60 kg for short duration varieties and
- 20 kg for hybrid

DIRECT WET SEEDED PUDDLED LOWLAND

✓ **RICE-** Direct wet seeding can be followed in all the areas wherein transplanting is in vogue.

- ✓ **Dry Bed Method-** This method is practiced in areas where water is not sufficient to grow seedlings in wet nurseries.

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Dapog Method

This method of raising nurseries has been introduced in **India from Philippines.**

It has been adopted by some farmers in **Andhra Pradesh for raising seedlings.**

The main merit of this method is that **less area is needed to raise seedlings. 25 to 30 square meters of area** is enough to raise seedlings sufficient for planting **one hectare.**

Dapog seedlings would be ready for transplanting within **11 to 14 days of sowing.**

❖ GENETICALLY MODIFIED RICE –

- ✓ The rice genome is usually modified using particle bombardment via the use of a gene gun or more commonly, a process known **as agro-bacterium mediated transformation.**
- ✓ Rice plants can be modified in DNA to be **herbicide resistant, resist pests, increase grain size, generate nutrients, flavours or even produce human proteins.**

❖ Nutritional value (Golden rice)

- It has been suggested that rice could be fortified to reduce the level **of nutritional vitamin A deficiencies.**
- **Golden rice was originally created by Dr. Ingo Potrykus** and his team in Zurich, Switzerland.

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- This genetically modified rice is capable of **producing beta-carotene** in the **endosperm (grain)** which is a **precursor for vitamin A production**. In addition, Golden rice had increased **iron content**.

Pest resistance –

- **BT rice** is modified to express the **cry IA (b) gene of the *Bacillus thuringiensis* bacterium**.
- The gene confers resistance to a variety of pests including the rice borer through the production of **endotoxins**.
- The benefit of this is that the farmers did not need to spray their crops to control fungal, viral, or bacterial pathogens.

Herbicide resistant varieties

- Some companies introduce herbicide resistance in the non-target crop so as to make their herbicides more effective on their targets.
- Most traditional herbicides work on **dicotyledons** and do not work on grasses.
- **Monsanto** conducts research on rice that can **tolerate glyphosate (active ingredient in the herbicide with trade name of "Roundup")** to produce **"Roundup Ready rice"**. Bayer's line of herbicide resistant rice is known as **Liberty Link**.

Cereals crop Rice

Critical stage for irrigation

- The **most important critical stage for irrigation** is **tillering to flowering**. The water supply should be ensured in required amount during panicle initiation to flowering stage.
- ❖ The critical stages of rice for both fertilizer application and irrigation are- **Tillering and Panicle Initiation (PI)**.
- ❖ Rice crop requires 5 irrigations for its life cycle.
- ❖ **Rice crop has 5 critical growth stages in respect of irrigation:**
 1. **Seedling**
 2. **Tillering**
 3. **Panicle Initiation (PI)**
 4. **Flowering**
 5. **Dough/Maturity**
- ❖ Rice crop is a **lowest water use efficiency (WUE) and highest water consuming crop**, which requires 5000 litres of water to produce 1 kg of yield.
- ❖ **IW/CPE ratio of rice is 1:20.**
- ❖ Highest nitrogen loss in rice field occurs due to **de-nitrification process**.
- ❖ N₂ loss in rice field can be reduced by placing the ammoniacal fertilizer (NH₄⁺) in reduced zone and nitrate fertilizer (NO₃⁻) in oxidized zone.
- ❖ In low land rice, fertilizer is applied in reduced zone only.

Cereals crop Rice

Biological Nitrogen Fixation:

- ✓ It has been estimated that the total nitrogen requirement of rice could be brought down by about **25-30 %** through biofertilizer (algae).
- ✓ In addition to **blue green algae (BGA)**, the association of the water **fern Azolla** with the blue green algae **Anabaena Azolla** also helps in biological nitrogen fixation.
- ✓ **Azotobacter**, **anon-symbiotic nitrogen fixing bacteria** also fixes atmospheric nitrogen biologically in rice field.

Khaira disease:

- ✓ **Zn deficiency** causes **Khaira disease in rice** usually at nursery stage.

Symptoms of Khaira disease-

- ✓ The **tip of the zinc deficient leaves first become yellow** and then **dry** and **plant remains stunted**.
- ✓ Zinc deficiency is marked by the **appearance of rust-coloured or brownish red coloration on the surface of the outer leaves**.
- ✓ First reported by **Y.L. Nene in 1966 at Pantnagar, Uttarakhand**.
- ✓ It is managed by **spray of @5 kg zinc sulphate at nursery stage** or foliar spray of **0.5 per cent zinc sulphate** in field.

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Browning of rice:

- ✓ **Iron toxicity in rice** is known as **browning of rice**.
- ✓ Iron toxicity is the major problem to rice production in **water logged acid-sulphate soils of ultisols & oxisols soil orders**.
- ✓ The beginning of iron toxicity is characterized by the appearance of **purple coloration at the leaf tips** and finally has a **scorched appearance**.
- ✓ **Phalguna variety** is tolerance to **Fe-toxicity**.

Silicon in rice:

- ✓ **Silicon** is regarded as **essential nutrient in rice production**.
- ✓ Silicon deficient plants **are soft and droopy**.
- ✓ Silicon supply mostly required during the **panicle initiation stage** because during this stage root activity is relatively reduced and the rate of transpiration is high.
- ✓ It has been noticed that silicon provides a **thick cuticle-silica layer** which functions as a barrier against **attack by insects' pests**.
- ✓ Silicon deficiency can be **corrected by application of basics lag @ 1.5-2.0 t/ha**. Because **basic slag is the most common** source of calcium silicate.

Cereals crop Rice

Weed management:

- ✓ *Echinochloa crus-galli* (barn yard grass) and *Echinochloa colona* (wild rice) are major weeds in rice.
- ✓ The weed problem is less in low land transplanted rice compared to upland direct seeded.

Herbicides used in rice crop:

- ✓ **Propanil (Stam F-34)** @ 3 kg ai. /ha is applied at 1 week after transplanting or post emergence of weeds.
- ✓ **Butachlor (Machete)** @ 2-3.0 kg/ha is used as pre-emergence i.e. Weeds have not emerged in field.
- ✓ It is effective to control both annual grasses and broad leaved as pre emergence of weeds because emerged weeds are not killed.

Beushening

- ✓ It involves **cross ploughing the young crop**, 4-6 weeks after sowing with a light country plough in **5-10 cm standing water**, once or twice.
- ✓ Purpose behind this to **control weeds, optimize crop stand and provide soil aeration**.

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Puddling

- ✓ It is a process of **destruction of soil aggregates** by mechanical force in soils with excessive moisture content.
- ✓ Puddling destroys the **soil structure** which **hampers root penetration** and the development of the succeeding upland crop grown in rotation with rice.
- ✓ Puddling **increases the bulk density** of soil about from **1.4 to 1.7 g/cc**.
- ✓ It is done with equipment, known as **puddler**.

Objective of puddling-

- ✓ Main objective is to **reduce the percolation losses of water**.
- ✓ To **reduce weed infestation**.
- ✓ To **increase nutrients availability**.

Critical stages for water

- ✓ **Tillering stage:** It comes 2-20 days after transplanting.
- ✓ **Booting or late panicle initiation stage:**

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- ✓ **Swelling of the flag leaf sheath** is called booting.
- ✓ It is **most critical stage** for water in rice crop.

Processing of rice:

- ✓ **Milling:** The **aleurone layer and embryo** are removed during the **polishing of rice grain**.
- ✓ There is a **loss of vitamin B**, particularly **thiamine**, the deficiency of which causes the disease called '**beriberi**' in those persons who continuously eat polished rice.
- ✓ **Polishing of rice:** The removal of **very fine bran clinging to milled rice** and **smoothening of the surface** is called polishing.
- ✓ **Parboiling:** It is a hydrothermal process in which the crystalline form of starch is changed in to an amorphous form on account of irreversible swelling and fusion of starch.
- ✓ **Parboiling of rice conserves vitamin B12.**

MAJOR DISEASE-

DISEASE NAME	CAUSAL ORGANISM
Blast of Rice	<i>Pyricularia oryzae</i>
Brown Spot of rice	<i>Helminthosporium oryzae</i>
Foot rot or Bakanae disease	<i>Fusarium fujikuroi</i>

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Bacterial leaf blight (Kresek”)	<i>Xanthomonas oryzae</i> pv. <i>Oryzae</i>
Udbatta disease	<i>Ephelis oryzae</i>
False smut	<i>Ustilagoidea virens</i>
Sheath blight	<i>Rhizoctonia solani</i>

MAJOR INSECTS-

INSECT	SCIENTIFIC NAME
(GLH) Green leafhopper	<i>nephotettix virescens</i>
(BPH) Brown plant hopper	<i>nilaparvata lugens</i>
Rice Gundhi bug	<i>leptocorisa acuta</i>
White backed plant hopper	<i>sogatella furcifera</i>
Thrips	<i>stenchaetothrips biformis</i>

Other important Disease

Disease name	Cause of disease
Akiochi disease	caused by H ₂ S toxicity
Khaira disease	caused by Zn deficiency
Montek disease	caused by rice root nematode
White eye	Fe deficiency

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Dead heart and white ear	caused by yellow stem borer of rice
Killer disease of rice	Bacterial Leaf Blight (BLB) and tungro virus





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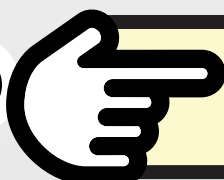
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