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**Course name :**

**Crop Production Technology-II  
(ASAG 2204)**

**Course credit :**

**(2-1-0)**

**Lecture 15**

**Topic: Potato**



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- **SCIENTIFIC NAME** *Solanum tuberosum*
- **FAMILY** *Solanaceae*
- Most important food crop of the world.
- **Poor man's friend.**
- Being cultivated for more than 400 years.
- Economical food, low cost energy to human diet.
- Rich source of starch, vitamins especially C and B1.
- They contain essential amino acids like leucine, tryptophan and isoleucine.
- Used for production of starch and alcohol.



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**Origin :** South America

Introduced to India from Europe by Portuguese in 17<sup>th</sup> century.

## **1.1 AREA and PRODUCTION**

- Important growing countries are **Russia, Poland, USA, China, India, Germany and Spain.**
- In India, the leading states are **UP, WB, Bihar and Punjab.**
- Largest producer **UP**, followed by **WB.**
- India, **Area: 2.08 mha**

**Production: 48.01 mt**

**Yield 23126 kg/ha (2014-15)**

### ***Potato Institutes***

**Central potato research institute: Shimla**

**International Potato Centre: Lima, Peru**



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# True Potato seed (TPS)

- The TPS was first evolved through sexual reproduction like tomato, chili, brinjal etc., by Ramanujam in 1957 and subsequently
- its commercial viability was tested. However, high heterozygosity of seedlings of TPS and uniformity in crop hampered its commercial adoption by farmers.
- 100 grams of true potato seed, approximately 100,000 to 120,000 seeds. It would take more than 3 tons of 1 ounce seed tubers to start the same number of plants.



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## 1.2 Climate

- Optimum maximum temp for growth & development: **15-25<sup>0</sup> C**
- Optimum temp. for tuber growth: **17-19<sup>0</sup> C**
- Tuber initiation reduced with night temp: **> 20<sup>0</sup> C**
- High temp affect the tuber growth: **>30<sup>0</sup> C**
- At high temp. respiration rate increases and assimilates produced by photosynthesis are consumed rather than stored in the tuber.
- Under high temperature, plants are elongated, leaves become wrinkled.
- High humidity along with cloudy days and rains are congenial for spread of fungal diseases.
- Sunshine along with cooler nights, assures less occurrence of diseases.



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## 1.3 SOIL

- Grown on wide range of soils ranging from sandy loam , silt loam , loam and clay soil.
- Soil should be **easily friable, well aerated, deep** and well supplied with **organic matter**.
- **Well drained sandy loam soils rich in humus are most suitable.**
- Light soils – easy for harvesting and maintains uniform temperature.
- **Alkaline / saline soils are not suitable for potato growing.**
- **Well suited to slightly acidic soils**, as acidic soil tends to limit scab disease.



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## **1.4 VARIETIES**

### **1.4.1 Early varieties ( 70-90 days)**

- kufri Pukhraj, Kufri Jawahar, Kufri Ashoka, kufri Laukar

### **1.4.2 Mid varieties ( 90-100 days)**

- Kufri Anand, Kufri Chipsona, Kufri Chipsona 2, Kufri Sultaj, Kufri Swarna, Kufri Lalima, Kufri Bahar, Kufri Jyoti, K. Ckandramukhi

### **1.4.3 Late varieties ( 110-130 days)**

- Kufri Giriraj, Kufri Sinduri.

**[FURTHER STUDY: Textbook of Field Crop Production- Commercial Crops, Vol.-II ]**





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## **1.5 CROPPING SYSTEMS**

- **Maize – Potato**
- **Rice – Potato**
- **Soybean – Potato**
- **Cowpea – Maize – Potato**
- **Maize – Potato- Wheat**
- **Maize – Potato- Onions**
- **Jute – Potato – Sesame**

## **1.6 Field preparation**

- Well pulverized seed bed, for good tubers.
- Ploughing, 20-25 cm deep with soil turning plough. 2-3 harowings or 4-5 ploughings with local plough. 1-2 plankings for leveling. Ridger can be used for commercial large scale planting.





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## 1.7 MECHANIZATION IN POTATO CULTIVATION

- **Sub-soiler** for deep tillage
- **Fertilizer drill** for fertilizer application
- **Automatic potato planter** for planting of tubers
- **Potato sprayer** for spraying of agro-chemicals
- **Multipurpose digger** for digging of tubers
- **Potato tiller** for exposing of leftover tillers
- **Grader** for grading of tubers
- **Treatment machine** for treatment of tubers



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## 1.8 SEED AND SOWING

### Selection of seed

- Healthy seed tubers, free from pest and diseases.
- The tubers showing surface disease like wart, scab, brown rot and nematode must be separated out.
- Seed tubers should be pure, free from varietal mixture.
- Seed tubers should be certified.
- Seed tubers must be uniform in size and shape, right stage of sprouting (sprouts are of 1cm long).
- Seed tubers should not be shriveled.
- Well sprouted 30-40 g seed tuber (3.5-5.0 cm diameter) is preferable.
- Whole seed tuber is preferable. It assures less chance of disease infestation.
- If tubers are cut, then each cut should contain 2-3 prominent eyes.
- When the tubers are cut and found any diseased tuber, the cutting tool must be disinfected before cutting of another fresh tuber.



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## **1.9 SEED TREATMENT**

### **DORMANCY BREAKING**

To break dormancy tubers are treated with 1% thiourea (1 kg in 1000 l of water) plus 1 ppm gibberlic acid (1 mg in 1 litre of water) for 1 hour followed by treatment with 3% ethylene and tubers are kept in air tight space for 72 hrs.

### **AGAINST FUNGAL DISEASE**

Seed tubers may be soaked with 0.2% Mancozeb or Captan solution for 20 minutes to avoid fungal diseases.



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## 1.10 PLANTING TIME

Region	Season	Planting	Harvesting
NW Planis	Early	Mid September	Mid Nov. – Dec.
	Autumn	Mid October	February – March
	Winter	October	January – March
	Spring	Mid January	March – April
West - Central Plains	Winter	Mid October	February – March
NE Plains	Winter	Early November	January – February
NE Hills	Summer	February – Mar	July – August
	Autumn	September	December
NW Hills	Summer	April – June	September – Oct
	Spring	February – Mar	July – August
Southern Hills	Summer	Mid April	August
	Autumn	August – Sept	December – Jan
	Spring	January – Feb	May – June

**Source: Text Book of FC Production, Vol.-II, Ed. R. Prasad, ICAR**



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## 1.11 SEED RATE

30-40 Q/ha

## 1.12 SPACING

**Row to row** 55 and 60 cm (**early crop**); 45-60cm (**main crop**)

**Plant to plant** 20 and 25 cm (**early crop**); 15-20 cm (**main crop**)

## 1.13 SEED SIZE

30-40 g.

## 1.14 OTHER CONSIDERATIONS

Whole tubers should be planted for early crop. This will avoid rotting/drying of tubers. Due to high temp and moisture, more rotting will be there.

For main crop, both whole and cut tubers can be planted.

Each tuber/ Cut should have 2-3 eyes.



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## 1.15 METHODS OF PLANTING

### ➤ **Planting on ridges**

45-60 cm deep.

### ➤ **Flat method**

Shallow furrows, 60 cm apart ridges, made after germination, suitable for light soils.

### ➤ **Planting on flat surface followed by ridges**

shallow furrows 60 cm apart. Planted in furrows after planting small ridges are made.





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## 1.16 MANURES AND FERTILIZERS

### ○ 10-20 t FYM / ha

- **General Dose** N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O **100-120: 80-120:120** Kg/ha. Soils with good fertility+ loam soils **100-120 kg N /ha**. Sandy soils with low organic matter **120-150 kg N /ha**
- **High N delays tuber initiation and maturity of crop.** Apply half N and full P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O at the time of sowing, remaining half of N at the time of **top dressing (30-35 DAS).** **Optimum Fertilizer requirement (kg/ha) is as follows**

Regions	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
<b>NW / NE / NC Plains</b>	110-166	25-29	34-67
<b>NW hills / NE hills</b>	85-148	66-112	64
<b>Southern hills</b>	120	35	38



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## **1.17 WATER MANGEMENT**

- **Drainage** is more important.
- Soil should be **kept moist but hardening or too wet conditions of soil should not be allowed.**
- **Over-flooding** of water on ridges should be **avoided.**
- **3-4 irrigations in medium to heavy soil.**
- **8-12 irrigations in sandy soil.**
- **Water requirement 30 cm.**

## **1.18 EARTHING UP**

- Development of tubers depends up on **aeration, moisture availability and soil temp.**
- It should be done when plants attain 15-22 cm height.
- Earthing is done at the time of top dressing of nitrogenous fertlizers ( 30-35 DAS).
- If needed 2<sup>nd</sup> earthing up done after 2 weeks of 1<sup>st</sup> one.

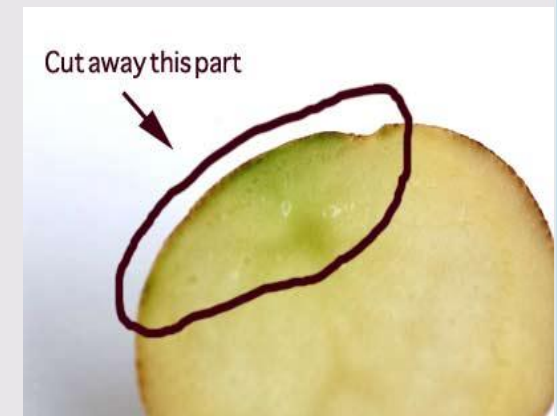


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## 1.19 WHY EARTHING IS ESSENTIAL?

- Potato tubers are modified underground stems which use to synthesize anthocyanin and chlorophyll if exposed to sunlight.
- Therefore, it is essential to cover the tubers fully with soil, because with chlorophyll formation tubers stop accumulation of starch, turn into green and remain smaller.
- **Solanine** formation in green tubers result in bitter taste of tubers, and it is **harmful if consumed**.
- **Solanine** is a glyco-alkaloid poison, found in species of the genus *Solanum*.





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## 1.20 HOW HARMFUL SOLANINE IS?

- **Solanine** poisoning is primarily displayed by gastrointestinal and neurological disorders. Symptoms include **nausea, diarrhea, vomiting, stomach cramps, burning of the throat, cardiac dysrhythmia, nightmares, headache, dizziness, itching, eczema, thyroid problems, inflammation and joints pain.**
- In more severe cases, **hallucinations, loss of sensation, paralysis, fever, jaundice, hypothermia and death** have been reported.
- Ingestion of **solanine** in moderate amounts can cause death. One study suggests that doses of 2 to 5 mg/kg of body weight can cause toxic symptoms, and doses of 3 to 6 mg/kg of body weight can be fatal.
- Symptoms usually occur 8 to 12 hours after ingestion, but may occur as rapidly as 10 minutes after eating high-**solanine** foods.





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## 1.21 WEED CONTROL

- Usually manual weeding is done.
- In case of **perennial weeds** like motha or doob grass **Gramxone @ 2.5 L / 1000 litres of water/ha.**
- As it is contact herbicide it should not be sprayed on crop plants and should spray when crop is 5-10 % germinated.
- **Alachlor ( Lasso) – 4l/ha-pre emergence**
- **Metribuzin (Sencor) – annual grasses and broad leaved weeds @ 1kg/ha in 800 L of water.**



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## **1.22 DISEASES**

- ✓ **Late blight**
- ✓ **Early blight**
- ✓ **Black scurf**
- ✓ **Wart**
- ✓ **Mosaic**
- ✓ **Leaf roll**

## **1.23 PESTS**

- ✓ **Epilachna beetle**
- ✓ **Cutworms**
- ✓ **Aphids**
- ✓ **Leaf hoppers**
- ✓ **White grub**
- ✓ **Potato tuber moth**



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## 1.24 HARVESTING

- Crop should be harvested when haulms start yellowing and falling on ground.
- Crop should be harvested about 15 days after cutting the haulms.
- Optimum moisture should be available.
- Potato diggers are now available.
- After digging the tubers to be dried in shade for 2-3 days

## 1.25 YIELD

- 30-40 t/ha