

**PRACTICAL MANUAL**

**PRODUCTION OF UNDERUTILIZED VEGETABLE CROPS**

**Course No. HVS-509; Credit Hrs. 3(2+1)**

**For M.Sc. (Horticulture) Vegetable Science**

**II-year (1<sup>st</sup>Semester)**



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Science .....semester in the year.....in the respective lab/field of  
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## Experiment No. 1

### Objective- Identification and botanical description of underutilized vegetable crops

| Common name     | Botanical name | Family | Origin | Ch.no. |
|-----------------|----------------|--------|--------|--------|
| Red cabbage     |                |        |        |        |
| Chinese cabbage |                |        |        |        |
| Kale            |                |        |        |        |
| sweet corn      |                |        |        |        |
| Asparagus       |                |        |        |        |
| Leek            |                |        |        |        |
| Globe artichoke |                |        |        |        |
| Chinese chive   |                |        |        |        |
| Sweet gourd     |                |        |        |        |

|               |  |  |  |  |
|---------------|--|--|--|--|
| Spine gourd   |  |  |  |  |
| Teasle gourd  |  |  |  |  |
| Round gourd   |  |  |  |  |
| Ivy gourd     |  |  |  |  |
| Snake gourd   |  |  |  |  |
| Kachri        |  |  |  |  |
| Pointed gourd |  |  |  |  |
| Long melon    |  |  |  |  |
| Snap melon    |  |  |  |  |
| Gherkin       |  |  |  |  |
| Celery        |  |  |  |  |
| Parsley       |  |  |  |  |

|                      |  |  |  |  |
|----------------------|--|--|--|--|
| Indian spinach (Poi) |  |  |  |  |
| Spinach              |  |  |  |  |
| Water spinach        |  |  |  |  |
| Chenopods            |  |  |  |  |
| Chekurmanis          |  |  |  |  |
| Elephant foot yam    |  |  |  |  |
| Yam bean             |  |  |  |  |
| Lima bean            |  |  |  |  |
| Winged bean          |  |  |  |  |
| Yam                  |  |  |  |  |

**Experiment No. 2**

**Objective-** To study about the botanical description of Chinese cabbage

**Introduction:**

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**Materials Required:**

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**Root:**

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**Steam:**

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**Leaves:**

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**Floral Biology and floral structure**

**Inflorescence:**

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**Flower:**

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**Calyx:**

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**Corolla:**

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**Androecium:**

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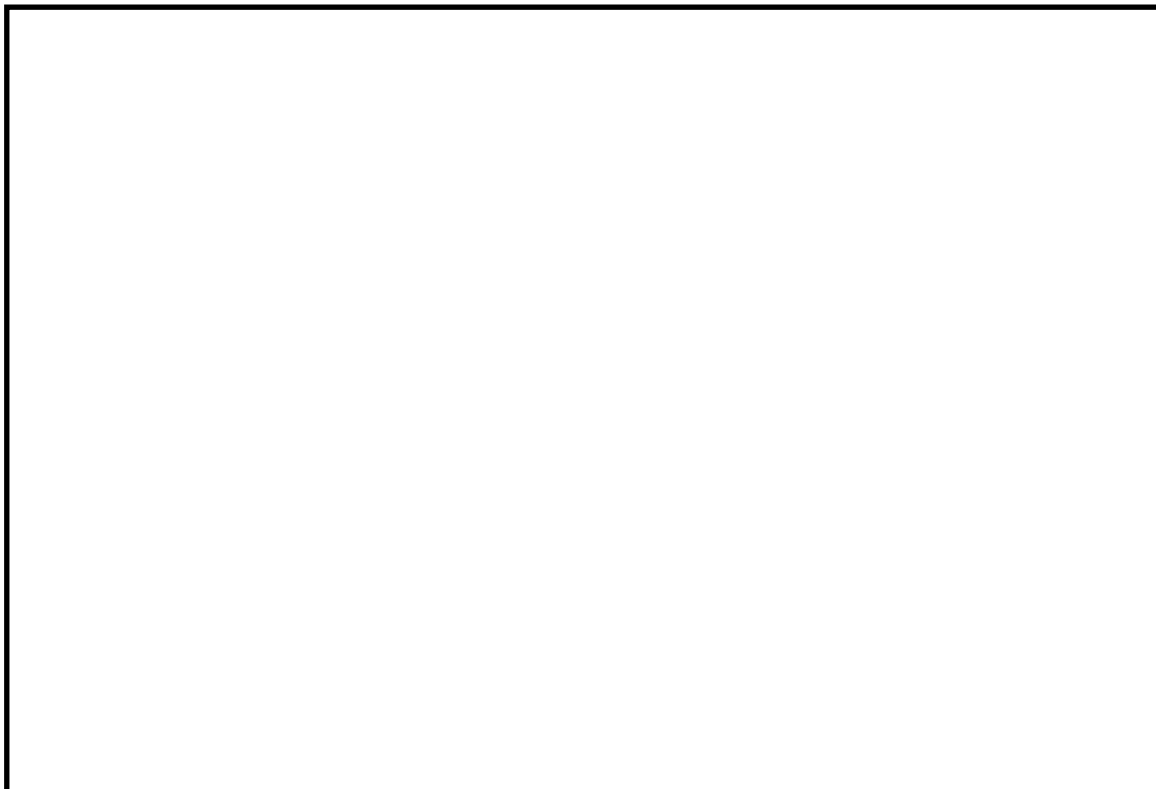
**Gynoecium:**

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**Floral**

**formula**.....

**Draw flower structure and floral diagram:**





**Experiment No. 3**

**Objective-** To study about the botanical description of lettuce

**Introduction:**

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**Materials Required:**

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**Root:**

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**Steam:**

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**Leaves:**

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**Floral Biology and floral structure**

**Inflorescence:**

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.....

**Flower:**

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**Calyx:**

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**Corolla:**

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.....  
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**Androecium:**

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**Gynoecium:**

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**Floral**

**formula**.....

**Draw flower structure and floral diagram:**



**Experiment No. 4**

**Objective-** To study about the botanical description of Ivy gourd

**Introduction:**

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**Materials Required:**

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**Root:**

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**Steam:**

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**Leaves:**

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**Floral Biology and floral structure**

**Inflorescence:**

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**Flower:**

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**Calyx:**

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**Corolla:**

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**Androecium:**

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**Gynoecium:**

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.....

**Floral**

**formula**.....

**Draw flower structure and floral diagram:**



**Experiment No. 5**

**Objectives- Description of commercial varieties and hybrids of underutilized vegetable crops**

| <b>Crop</b>     | <b>Varieties</b> | <b>Specific feature of variety</b> |
|-----------------|------------------|------------------------------------|
| Red cabbage     |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Chinese cabbage |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Kale            |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Asparagus       |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Leek            |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Globe artichoke |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Sweet gourd     |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Spine gourd     |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
|                 |                  |                                    |
| Teasle gourd    |                  |                                    |
|                 |                  |                                    |

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|---------------|--|--|
|               |  |  |
| Round gourd   |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
| Ivy gourd     |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
| Snake gourd   |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
| Kachri        |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
| Pointed gourd |  |  |
|               |  |  |
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|               |  |  |
|               |  |  |
| Long melon    |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
|               |  |  |
| Snap melon    |  |  |
|               |  |  |
|               |  |  |

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|----------------------|--|--|
|                      |  |  |
| Gherkin              |  |  |
|                      |  |  |
|                      |  |  |
| Celery               |  |  |
|                      |  |  |
|                      |  |  |
| Parsley              |  |  |
|                      |  |  |
|                      |  |  |
|                      |  |  |
| Indian spinach (Poi) |  |  |
|                      |  |  |
|                      |  |  |
| Spinach              |  |  |
|                      |  |  |
|                      |  |  |
|                      |  |  |
|                      |  |  |
| Water spinach        |  |  |
|                      |  |  |
|                      |  |  |
| Chenopods            |  |  |
|                      |  |  |
|                      |  |  |
| Chekurmanis          |  |  |
|                      |  |  |
|                      |  |  |
| Elephant foot yam    |  |  |
|                      |  |  |
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|                      |  |  |





**Experiment No. 6**

**Objectives-** To study about the scientific raising of nursery and seed treatment of underutilized vegetable crops

**Importance of scientific raising of nursery**

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**Materials Required:**.....

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**Factors affecting raising nursery**

**Location of the nursery:**

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**Soil**

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**Procedure of nursery bed preparation:**

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**Seed Treatment**

**Benefits of seed treatment:**

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**Name of Bio-agent use in seed treatment:**

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**Procedure of biological seed treatment**

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**Chemical seed treatments**

**Common fungicides used:.....**

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**Methods of using chemicals:**

- **Dry/ Dust method:**

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**Wet/ Slurry method:**.....

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**Procedure of chemical seed treatment**

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**Quantity of seed and nursery area required for raising seedlings for one hectare area**

| Crop | Seed rate (g/ha) | Nursery area required (m <sup>2</sup> ) |
|------|------------------|-----------------------------------------|
|      |                  |                                         |
|      |                  |                                         |
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**Procedure of seed sowing in nursery bed**

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**Irrigation**.....

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**Use of mulch**

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**Removal of mulch**

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**Use of shading nets or polysheets**

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**Thinning**

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**Intercultural and weed control**

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**Plant protection**

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**Hardening of the plants in the nursery**

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**Transplanting.....**

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**Experiment No. 7**

**Objective-** To study the methods of irrigation in underutilized vegetable crops

**Introduction**.....  
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**Materials Required:**  
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**Methods of irrigation**

**A) Surface irrigation:**  
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**1. Flood system:**  
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**2. Border method:**  
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**3. Furrow method:**

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**Basin method (ring and basin):**

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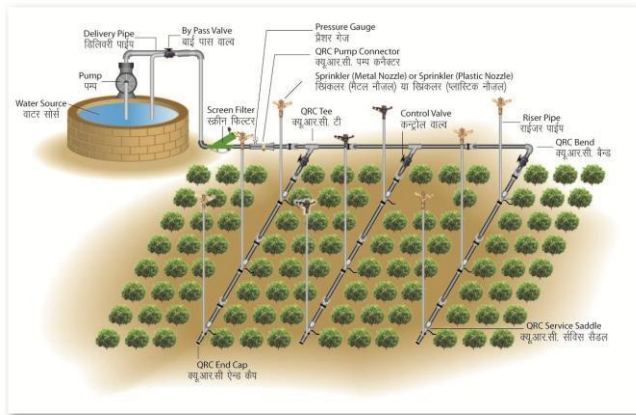
**B) Sub-surface/pipe irrigation:**

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**C) Localized irrigation:**

**1. Overhead or Sprinkler irrigation:**

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Layout of Sprinkler Irrigation System (छिड़काव सिंचाई प्रणाली का रेखाचित्र)

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**Experiment No. 8**

**Objective-** To study the methods of fertilizers and micronutrients application in of underutilized vegetable crops

**Introduction**.....  
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**Materials Required:**  
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**Methods of fertilizer application**

**A) Solid Fertilizers Application Methods**

**Broadcasting:**  
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**Top Dressing:** .....  
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**Side band:**

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**B) Liquid fertilizers application methods**

**Starter solution:**

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**Foliar application:**

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**Firtigation:**

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### Recommendation of primary nutrients (NPK) for different vegetable crops

| Crop               | Recommended dose of primary nutrients (kg/ha) |                               |                  |
|--------------------|-----------------------------------------------|-------------------------------|------------------|
|                    | N                                             | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O |
| Chinese Cabbage    |                                               |                               |                  |
| Asparagus          |                                               |                               |                  |
| Sprouting Broccoli |                                               |                               |                  |
| Leek               |                                               |                               |                  |
| Yam                |                                               |                               |                  |
| Long melon         |                                               |                               |                  |
| Elephant foot yam  |                                               |                               |                  |
| Spinach            |                                               |                               |                  |

Source of fertilizers supplying nutrients: Different fertilizer grade refers to the guaranteed minimum percentage of N, P<sub>2</sub> O<sub>5</sub>, and K<sub>2</sub>O contained in the fertilizer material. For example

### Synthetic fertilizers and their nutrient composition

| Fertilizer               | Composition (%) |                               |                  |
|--------------------------|-----------------|-------------------------------|------------------|
|                          | N               | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O |
| Urea                     | 46              | -                             | -                |
| Calcium ammonium nitrate | 25              |                               |                  |
| Single super phosphate   | -               | 16                            | -                |
| Double super phosphate   | -               | 32                            | -                |
| Diammonium phosphate     | 18              | 46                            | -                |
| Muriate of potash        | -               | -                             | 60               |

### Calculation

If the recommended dose of nutrient and the percentage content of that nutrient in the fertilizer are known, the quantity of fertilizer required can be calculated by using following formula.

$$\text{Quantity of fertilizer required (kg)} = \frac{(\text{Recommended dose of nutrient application})}{(\% \text{ Nutrient content present in the fertilizer})} \times 100$$

**Example:** Calculate the quantity of urea, single super phosphate (SSP) and muriate of potash (MOP) for one hectare of tomato as per application schedule viz., 1/3rd of N + full P and K at the time of planting and remaining N in two equal splits at one month interval. The recommended dose of nutrients is 120 kg N, 75 Kg P<sub>2</sub>O<sub>5</sub> and 60 kg K<sub>2</sub>O.

**Solution:**

Recommended dose of nutrients in tomato is 120 kg N, 75 Kg P<sub>2</sub>O<sub>5</sub> and 60 kg K<sub>2</sub>O.

Urea contains N = 46%

SSP contains P<sub>2</sub>O<sub>5</sub> = 16%

MOP contains K<sub>2</sub>O = 60%

**Applying the formula**

**Quantity of urea required (kg/ha)**

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**Quantity of SSP required (kg/ha)**

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**Quantity of MOP required (kg/ha)**

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**Application schedule**

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**Experiment No. 9**

**Objective-** To study about the mulching practices in underutilized vegetable crops

**Introduction**.....  
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**Materials Required:**.....  
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**Merit of mulch**.....  
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**Demerit of mulch:**.....  
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**Type of Mulch.** .....  
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**Experiment No. 10**

**Objective-** To study about the weed management in underutilized vegetable crops

**Introduction**.....  
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**Materials Required:**  
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**Chemical weed control:** .....  
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**Problems associated in chemical weed control:** .....

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**Procedure for pre-emergence application of weedicide:** .....

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**Calculation of dose of herbicide in terms of active in gradient**  
**Quantity of commercial product of herbicide (kg per ha)**

$$= \frac{\text{(Recommended dose of herbicide)}}{\text{(a.i of herbicide formulation)}} \times 100$$

**Solved example**

**If, you buy pendimethalin with 40% a.i. Its recommended dose of application in cabbage is 1.0 kg/ha. Then, the quantity of commercial product required will be**

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**Calculation of quantity of water to be used**

**If, Spraying herbicide with hand operated Knapsack Spray pump, water required to cover one hectare area varies from 700-800 litres. So calculate the amount of water for spraying weedicide in 0.6 ha area?**

**Quantity of water required per unit area (litre per unit area)  
(water required for one ha × area to be sprayed)**

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$$\frac{\quad\quad\quad}{10000}$$

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**Objective- Identification of important pest and their control in underutilized vegetable crops**

**Introduction.....**  
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**Materials Required**

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**Cole crops:.....**

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**Cucurbits.....**

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**Tuber crops:**

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**Leafy vegetable.....**

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**Experiment No. 15**

**Objective- - To study about the maturity indices of underutilized vegetables crops**

**Introduction.....**  
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**Physiological maturity.....**  
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**Horticultural maturity.....**  
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**Maturity indices for cool season vegetable crops**  
**Red cabbage .....**  
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**Chinese Cabbage**  
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**Sprouting Broccoli**  
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**Brussels Sprout**.....  
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**Kale**  
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**Elephant foot yam**.....  
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**Asparagus**.....  
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**Leek:**.....  
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**Globe artichoke**.....  
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**Ivy gourd:** .....  
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**Long melon:**.....

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**Round melon**.....

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**Yam**.....

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**Lima bean**.....

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**Celery** .....

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**Objective-** To study about the Post-Harvest management (Grading, Packaging, Marketing)

**Introduction**.....  
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**Materials Required:**  
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**Precooling**  
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**Advantages of precooling:**  
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**Grading:**  
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**Advantages of Grading:**  
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**Packaging:**

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**Packaging materials**

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**Transportation**

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**Marketing**

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**Storage**

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