

PRACTICAL MANUAL

# TROPICAL AND SUB-TROPICAL VEGETABLE CROPS

Course No. HVS-101; Credit Hrs. 3(2+1)

For B.Sc. (Horticulture) I-year (2<sup>nd</sup> Semester)

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2020

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Jhansi-284003

## Syllabus: Tropical and Sub-Tropical Vegetable Crops

**Practical:** Identification and description of tropical and sub-tropical vegetable crops; nursery practices and transplanting, preparation of field and sowing/planting for direct sown and planted vegetable crops. Herbicide use in vegetable culture; top dressing of fertilizers and intercultural; use of growth regulators; identification of nutrient deficiencies. Physiological disorder. Harvest indices and maturity standards, post-harvest handling and storage, marketing, seed extraction (cost of cultivation for tropical and sub-tropical vegetable crops), project preparation for commercial cultivation.

**Name of Student** .....

**Roll No.** .....

**Batch** .....

**Session** .....

**Semester** .....

**Course Name :** .....

**Course No. :** .....

**Credit** .....

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## CERTIFICATE

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Date:

Course Teacher

## CONTENT

S. No.	Topics	Page No.
1.	Identification and description of tropical and sub-tropical vegetable crops.	
2.	Description of varieties / hybrids tropical and sub tropical vegetable crops	
3.	To study about layout of kitchen garden	
4	Preparation of nursery beds for raising seedlings of tropical and sub tropical vegetable crops.	
5.	To study about the seed treatment of tropical and sub-tropical vegetable crops.	
6	To study about the seed sowing and nursery management for raising healthy seedlings of tropical and sub-tropical vegetable crops	
7	To study about the preparation of field for transplanting of seedlings or direct seed sowing	
8	To study about the use of herbicide for weeds control in tropical and sub-tropical vegetable crops	
9	To study about the top dressing method of fertilizer application in tropical and sub-tropical vegetable crops	
10.	To study about the use of plant growth regulators in important tropical and sub-tropical vegetable crops	
11.	To study about the nutrient deficiency in tropical and sub- tropical vegetable crops	
12	To study about the physiological disorders of tropical and sub-tropical vegetable crops	
13	To study about the maturity indices of tropical and sub-tropical vegetables crops	
14.	To study about the harvesting of tropical and sub-tropical vegetable crops.	
15	To study about the post harvest handling, marketing and storage of tropical and sub tropical vegetable crops.	
16.	To study about the seed extraction techniques in tropical and sub-tropical vegetable crops	
17.	To calculate the cost of cultivation of ..... crops per hectare	
18.	Project preparation of commercial cultivation of tropical and sub tropical vegetable	

## Experiment No. 1

**Objective- Identification and description of tropical and sub-tropical vegetable crops.**

Common name	Botanical name	Family	Origin	Ch.no.
Tomato				
Brinjal				
Chilli				
Okra				
Cucumber				
Musk melon				
Water melon				
Round melon				
Bitter gourd				
Bottle gourd				
Snake gourd				
Ridge gourd				
Sponge gourd				
Pumpkin				
Pointed gourd				
Cow pea				
Cluster Bean				
Dolichos Bean or Indian Bean				
Sweet potato				
Amaranthus				

**Experiment No. 2**

**Objective- Description of varieties / hybrids tropical and sub tropical vegetable crops**

<b>Crop</b>	<b>Varieties</b>	<b>Specific feature of variety</b>
<b>Tomato</b>		
<b>Brinjal</b>		
<b>Chilli</b>		
	<b>Okra</b>	

Cucumber		
Musk melon		
Water melon		
Round melon		
Bitter gourd		
Bottle gourd		

Snake gourd		
Ridge gourd		
Sponge gourd		
Pumpkin		
Pointed gourd		
Cow pea		

Cluster Bean		
Dolichos Bean or Indian Bean		
Sweet potato		
Amaranthus		



**Objective-** To study about the layout of kitchen garden

**Introduction-**.....  
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**Features of a Kitchen Garden**

**Perennial plot:** .....  
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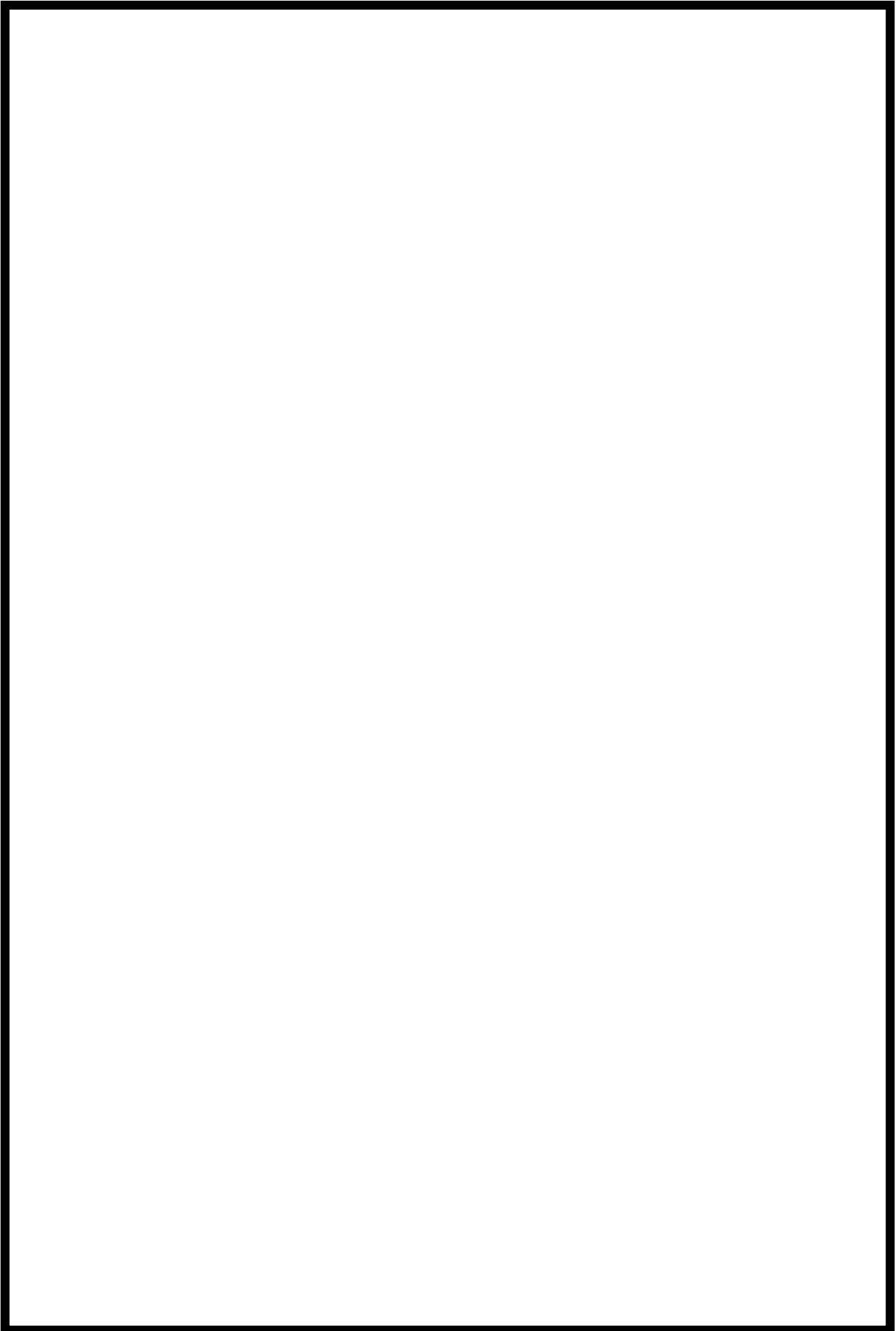
**Fence**.....  
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**Manure Pits**.....  
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**Paths and irrigation channels:** .....  
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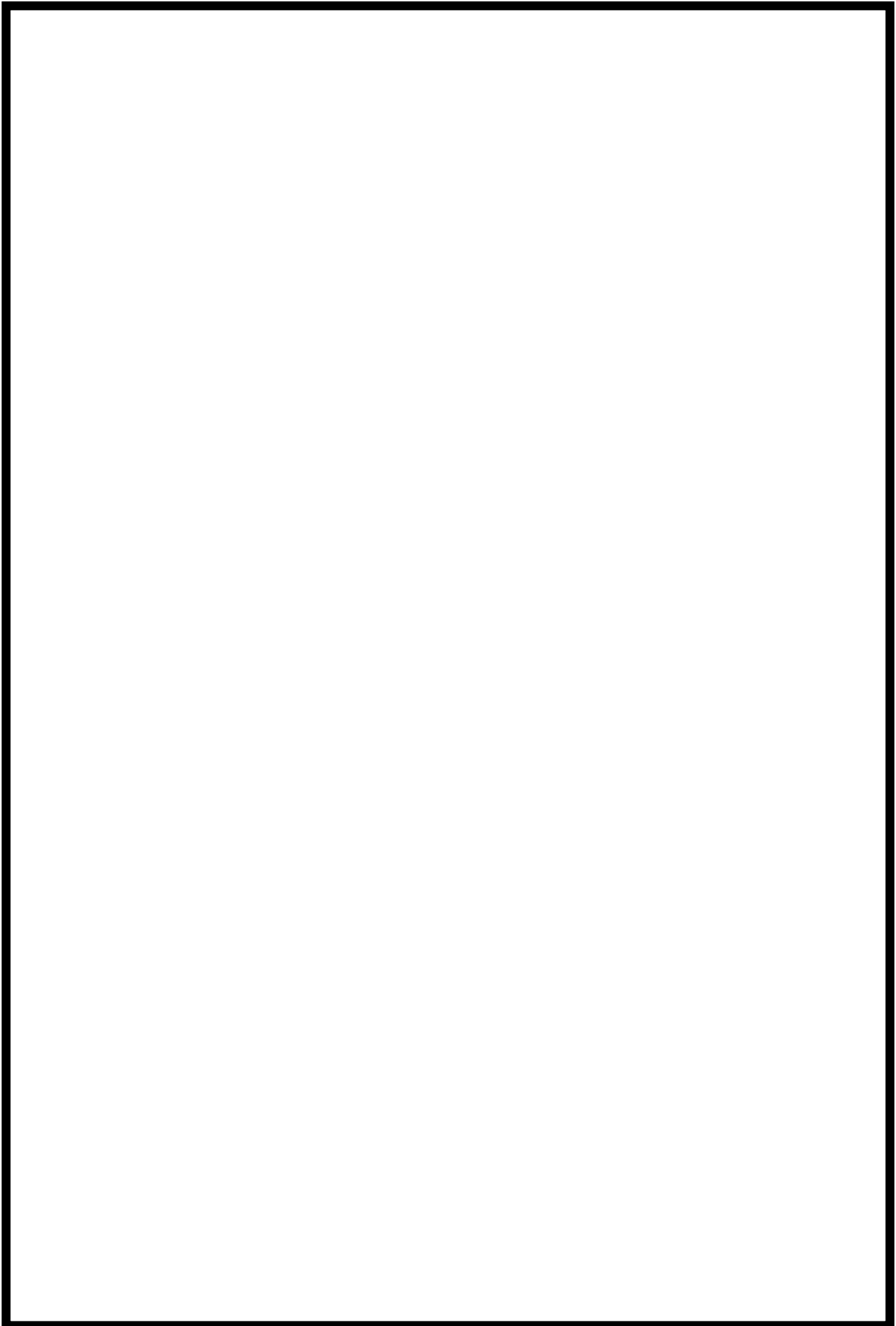
**Beds:** .....  
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Draw layout of Kitchen garden





Draw lay out nursery bed



**Experiment No. 5**

**Objective-** To study about the seed treatment of tropical and sub-tropical vegetable crops.

**Introduction**.....  
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**Materials Required:** .....  
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**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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**Advantages of nursery raising in vegetable production:** .....

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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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**Experiment No. 7**

**Objective-** To study about the preparation of field for transplanting of seedlings or direct seed sowing

**Introduction**.....  
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**Materials Required:** .....  
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**Selection of site for vegetable cultivation:** .....  
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**Characteristics of soil for vegetable cultivation:** .....  
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**Preparation of field/land:** .....  
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## Experiment No. 8

**Objective-** To study about the use of herbicide for weeds control in tropical and sub-tropical vegetable crops

**Introduction**.....

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

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**Chemical weed control:** .....

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**Advantages of chemical weed control:** .....

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**Critical period for crop-weed competition in different vegetable crops**

S. No.	Crops	Critical period after sowing/planting (days)
1.	Tomato	
2	Brinjal	
3	Chilli	
4	Okra	

**Precautions to be taken using herbicides:** .....

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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 tomato 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)

=  $\frac{\hspace{10em}}{10000}$

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**Experiment No. 9**

**Objective-** To study about the top dressing method of fertilizer application in tropical and sub-tropical vegetable crops

**Introduction**.....  
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**Materials Required:** .....  
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**Advantage of top-dressing fertilizer application:** .....  
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**Procedure of top dressing:** .....  
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**Experiment No. 10**

**Objective-** To study about the use of plant growth regulators in important tropical and sub-tropical vegetable crops

**Introduction**.....  
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**Materials Required:** .....  
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**Role of growth regulators in vegetable crops**

**Tomato:** .....  
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**Brinjal :** .....  
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**Chilli:** .....  
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**Gourds:** .....  
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**Tapioca:** .....  
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**Sweet Potato:** .....

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**Method of application:** .....

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## Experiment No. 11

**Objective-** To study about the nutrient deficiency in tropical and sub- tropical vegetable crops

**Introduction**.....

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

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**Nitrogen:** .....

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**Phosphorus:** .....

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**Potassium:** .....

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**Chloride:** .....

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**Magnesium**.....

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**Molybdenum:** .....

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**Sulfur:** .....

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**Boron:** .....

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**Iron:** .....

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**Zinc:** .....

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**Calcium:** .....

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**Copper:** .....

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**Manganese:** .....

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**Nikel:** .....

**Experiment No. 12**

**Objective-** To study the physiological disorders of tropical and sub-tropical vegetable crops

**Introduction**.....  
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**Materials Required:** .....  
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**A. Tomato**

**(i) Blossom end rot:** .....  
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**Causes:**.....  
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**Remedy:**.....  
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**(ii) Catface:** .....  
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**Causes:**.....

**Remedy:**.....  
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**(iii) Puffiness:** .....  
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**Causes:**.....

Remedy:.....

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(iv) Sun scald: .....

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Causes:.....

Remedy:.....

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(v) fruit cracking: .....

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Causes:.....

Remedy:.....

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**B. Brinjal**

(i) Poor fruit set: .....

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Causes:.....

Remedy:.....

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**C. Chilli**

(i) Blossom – end rot: .....

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Causes:.....

Remedy:.....

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(ii) Flower and fruit drop: .....

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**Causes:**.....

**Remedy:**.....

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**D. Cucurbits:**

**Preponderance of staminate flowers and low fruit set:** .....

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.....

**Causes:**.....

**Remedy:**.....

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.....

**E. Okra**

**Poor seed germination:** .....

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.....

**Causes:**.....

**Remedy:**.....

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## Experiment No. 13

**Objective- - To study about the maturity indices of tropical and sub-tropical vegetables crops**

**Introduction**.....  
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**Physiological maturity**.....  
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**Horticultural maturity**.....  
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### **Maturity indices for tropical and sub tropical vegetable crops**

#### **1. Tomato**

**a) Immature green**.....  
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**b) Mature green**  
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**c) Turning (breaker stage)**  
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**d) Pink stage**.....  
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**e) Hard ripe stage:** .....

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**f) Over ripe stage**.....  
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**2. Chilli** .....  
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**3. Sweet Potato:** .....  
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**4. Okra** .....  
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**6. Moringa:** .....  
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**7. Cucumber** .....  
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**8. Bottle Gourd:** .....  
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**9. Muskmelon:** .....  
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**10. Watermelon:** .....  
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**Experiment No. 14**

**Objective-** To study about the harvesting of tropical and sub-tropical vegetable crops.

**Harvesting:** .....  
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**Beans** .....  
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**Cucumbers** .....  
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**Brinjal:** .....  
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**Chilli**  
**Green fruits:** .....  
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**Red fruits:** .....  
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**Tomato:** .....  
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**Cucurbits** (cucumber, bottle gourd, bitter gourd, snake gourd, ridge gourd and sponge gourd)  
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**Summer squash:** .....  
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**Winter squash:** .....  
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**Leafy vegetables:** .....  
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.....

**Okra:** .....  
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.....

**Days taken to harvest after planting**

S. No.	Vegetable	Days to harvest after planting
1.	Brinjal	
2.	Tomato	
3.	Chilli	
4.	Palak	
5.	Spinach	
6.	Okra	
7.	Garden peas	
8.	Beans	
9.	Watermelon	
10.	Muskmelon	

11.	Cucumber	
12.	Bitter gourd	
13.	Sponge gourd	
14.	Squash	
15.	Pumpkin	

**Precautions:** .....

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**Experiment No. 15**

**Objective-** To study about the post harvest handling, marketing and storage of tropical and sub-tropical vegetable crops.

**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:** .....

Crop	Optimum temperature	Relative Humidity	Self life



**Objective-** To study about the seed extraction techniques in tropical and sub-tropical vegetable crops

**Introduction**.....  
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**Materials Required:** .....  
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**Extraction of method**

**Tomato**

**Fermentation method:** .....  
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**Acid method:** .....  
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**Alkali method:** .....  
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**Experiment No. 17**

**Objective-** To calculate the cost of cultivation of ..... crops per hectare

**Introduction**.....  
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**COST OF CULTIVATION OF ..... CROPS PER HECTARE**

**A. Cost of variable Resources:**

S. No.	Name of Item	Quantity	Rate (Rs/Kg)	Total cost (Rs)
1.	<b>Seed cost</b>			
2.	<b>Fertilizers cost:</b>			
I	FYM			
II	Urea			
III	SSP			
IV	MOP			
3.	<b>Plant protection cost:</b>			
A	<b>Name of Pesticides/insecticides</b>			
I				
II				
III				
B	<b>Fungicide:</b>			
I				
II				
III				
4.	<b>Labour cost:</b>			
A	Seed treatment			

<b>B</b>	Land preparation			
	(I) Ploughing			
	(II) Planting			
	(III) Preparation of ridges and furrows or beds			
<b>C</b>	Manures and Fertilizers application			
<b>D</b>	Inter-culture operations			
<b>E</b>	Irrigation			
<b>F</b>	Plant protection			
<b>G</b>	Harvesting			
<b>H</b>	Packing/electricity charges			
<b>I</b>	Nursery cost			
<b>5</b>	<b>Transports charge</b>			
	<b>Total cost</b>			
<b>6</b>	<b>Miscellaneous (2% of total cost)</b>			
<b>7.</b>	<b>Interest on working capital (5%)</b>			
<b>Total Variable cost</b>				

**B. Fixed Cost:**

S. No.	Item	Cost (Rs)
1	Land Revenue (Rs.12/ha)	
2	Rental Value of Land	
3	Management Cost (5% of working capital)	
4	Interest on Fixed Capital (5%)	
	<b>TOTAL FIXED COST</b>	

**Cost of cultivation** = Total Fixed Cost + Total Variable Cost.....

Average Yield .....

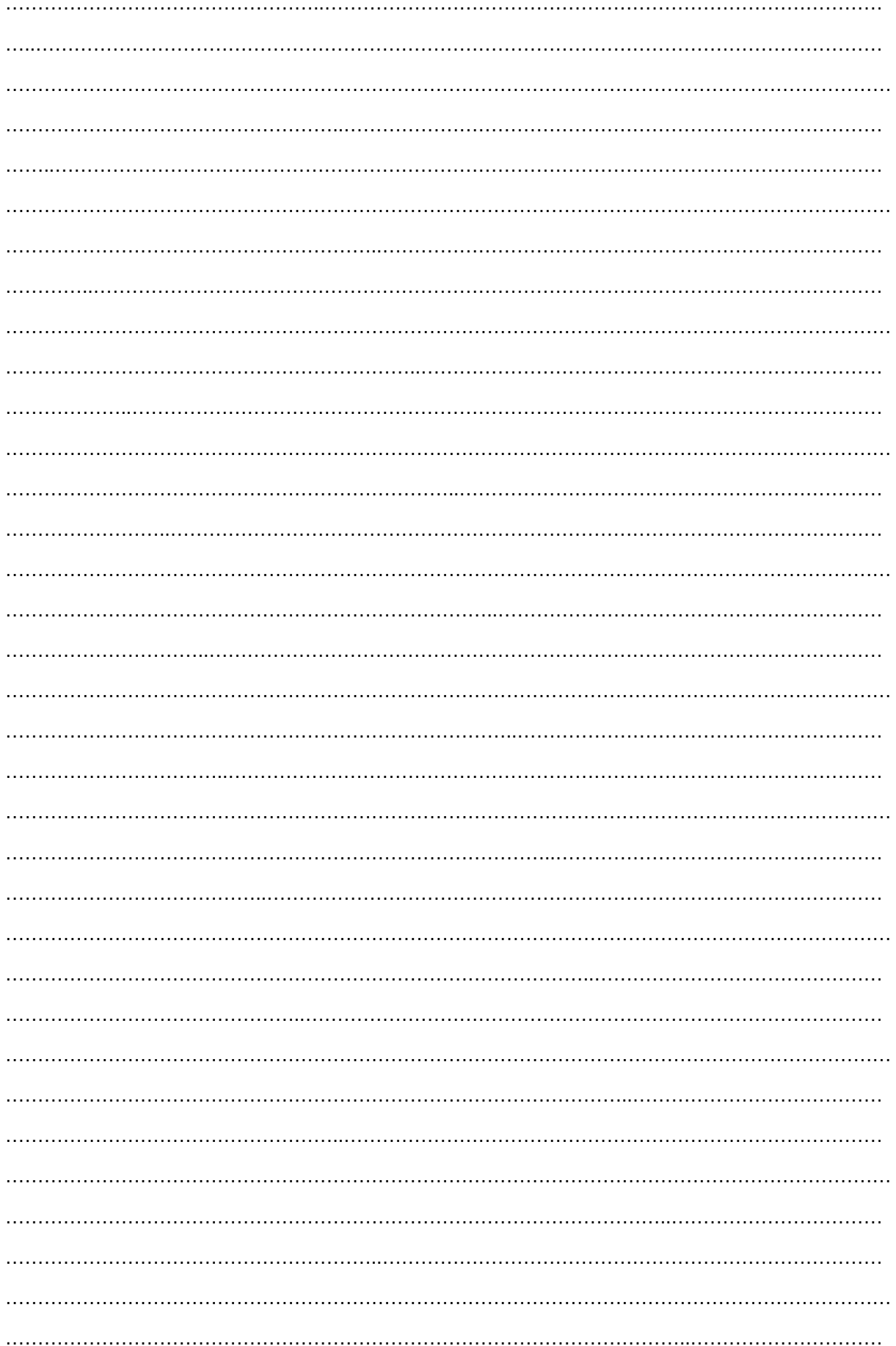
Sale Rate (Rs /kg)

Total Income/Cost of production/ha

**Net Return** = Total Income –total cost of cultivation

**Benefit Cost Ratio** = NET RETURN/ total cost of cultivation





## CROPPING PROGRAMME FOR A KITCHEN GARDEN

Bed No.	Vegetables	Season of growing
1.	Brinjal + radish	June-September
	Cabbage	October-January
	Bhindi	Feb-May
2.	Tomato + cluster beans	June-September
	Beet root	October-December
	Greens	Jan-Feb
3.	Cowpea	March-May
	Lab Lab bean	June-September
	Brinjal and Turnip	October-January
	Cluster beans	Feb-May

Bed No.	Vegetables	Season of growing
4.	Bhindi	June-Sep.
	Cauliflower	Oct-Jan
	Radish	Feb-March
5.	Greens	April-May
	Chilli + onion (small)	June- November
	Greens	Dec.-January
6.	Brinjal + Radish	Feb.-May
	Onion (Bellary)	June-September
	Chilli	Oct.-Feb.
	French beans	March-May

## CROPS AND DURATION

Sl. No.	Crop	Duration	Sl. No.	Crop	Duration (months)
1.	Tomato	3 ½ - 4 months	8.	Curry leaf	Perennial
2.	Brinjal	4 months	9.	Chekurmanis	Perennial
3.	Chilli	5 months	10.	Tapioca	Perennial
4.	Moringa	Perennial	11.	Amorphophallus	Perennial
5.	Banana	Perennial	12.	Dioscorea	Perennial
6.	W.I. Cherry	Perennial	13.	Colocasia	Perennial
7.	Lime	Perennial	14.	Spinach	Perennial

## SELECTIVE PRE-EMERGENCE AND EARLY POST-EMERGENCE HERBICIDES FOR VEGETABLE SEEDBEDS

a) Pre-emergence		
Herbicide	Dose (kg a.i./ ha)	Crop
Clomazone	0.18 - 0.27	Pepper, cucumber
Metribuzin	0.15 - 0.5	Tomato
Napropamide	1.0 - 2.0	Tomato, pepper, eggplant
b) Post-emergence (crops with at least 3 leaves)		
Clomazone	0.27 -0.36	Pepper
Metribuzin	0.075 - 0.150	Tomato
Rimsulfuron	0.0075 -0.015	Tomato

## SELECTIVE HERBICIDES FOR WEED CONTROL IN VEGETABLE CROPS

Herbicide	Dose kg a.i./ha	Treatment moment	Crops
Bensulide	5.5-7.2	Pre	Cucurbits
Bentazon	0.75-1	Post	Green peas, green beans
Chlorthal-dimetil (DCPA)	5.25-9.00	PP/Pre/Post	tomato, green beans
Clomazone	0.18-0.54	PP/Post	Pepper, green peas
Clomazone	0.18- 0.27	Pre	pepper, cucumber, squash, pumpkin
Clopyralid	0.70- 0.92	Post	Asparagus
Diuron	0.4- 2.4	Post	Asparagus
Ethalfuralin	0.8-1.7	PP	Tomato, pepper, beans, squash
Halosulfuron	24-48(g)	Pre/Post	Squash, cucumber
Metribuzin	0.35- 0.52	PP/Post	Tomato, asparagus
Metribuzin	0.10-0.35	Pre/Post	Tomato
Napropamide	1.57-2.02	PP/Post	Tomato, pepper, artichoke
Naptalam-Na	2.16-2.88	Pre	Melon and cucurbits
Oxifluorfen	0.24-0.48	PP	Tomato, pepper
Phenmedipham	0.55-1	Pre/Post	Beets, spinach
Rimsulfuron	7.5-15(g)	Post	Tomato
Trifluralin	0.59-1.44	PPI	Beans, artichoke, onion, pepper, tomato

Notes: Treatment moment: PP: pre-plantation, PPI: pre-plant incorporated, Pre: pre-emergence, Post: post-emergence.