

QUALITY PRODUCTION OF WATERMELON - NEED OF TODAY



Watermelon – History & Genetics

History:

- Archaeologists found watermelon seeds in 5000 Years Old settlement of Libiya
- Found 4000 year old watermelon paintings in Egypt
- Watermelon seeds were also found in a cave in Hang-Zhou, China circa 3000 BC

Origin: North-East Africa

Scientific Name: *Citrullus lanatus*

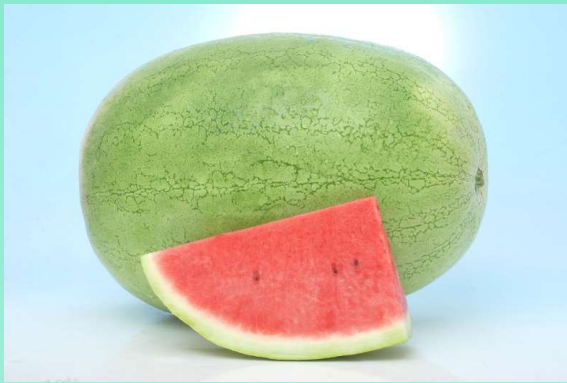
Family: Cucurbitaceae

Different Types in Watermelon

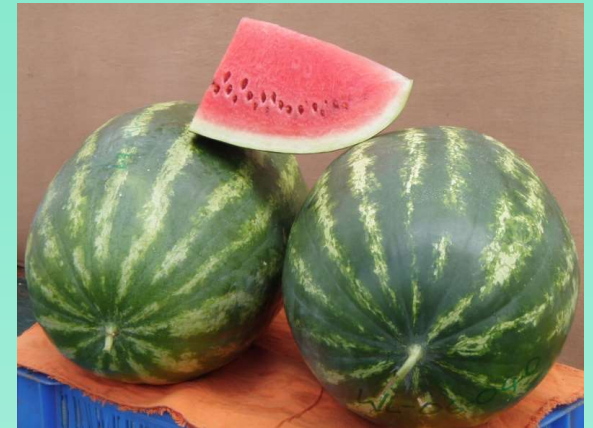


Different Types in Watermelon - Appearance

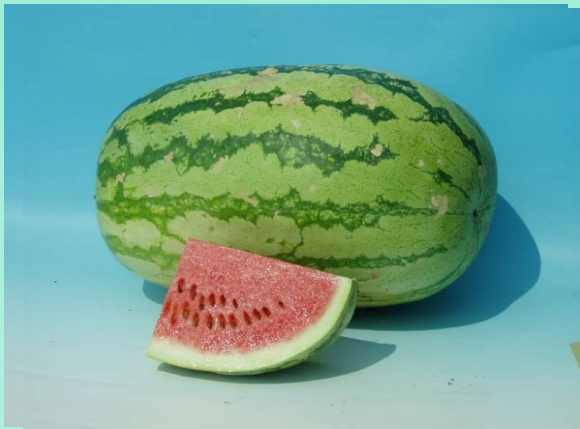
**CHARLSTON
GREY**



**CRIMSON
SWEET**



**DRAGON/TIGER
STRIP**



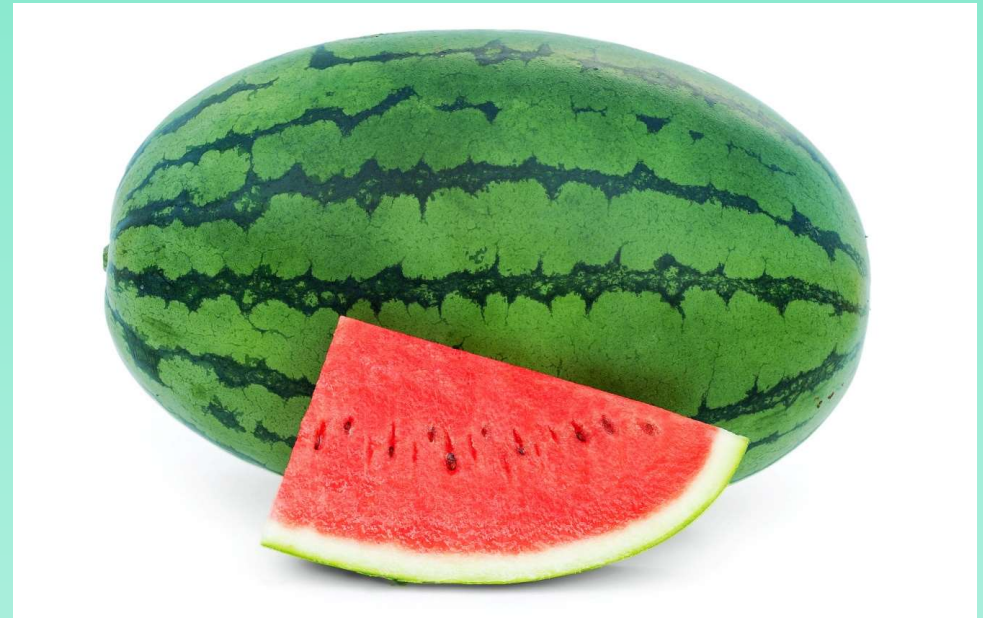
SUGARBABY



Different Types in Watermelon - SIZE

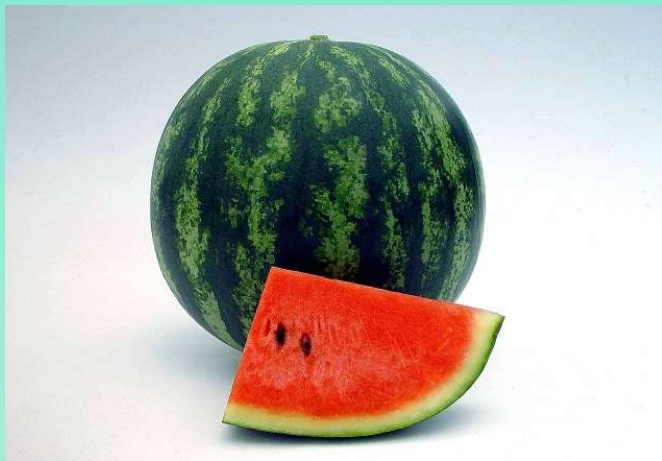


SMALL SIZED/ICE-BOX
(2 to 7 Kg)

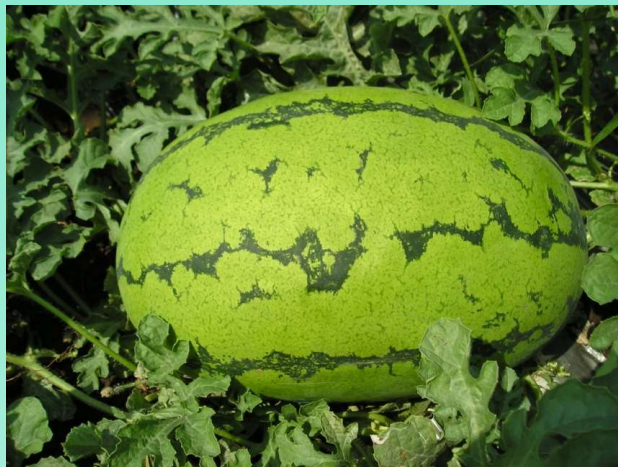


LARGE/BIG SIZED
(7 to 20Kg)

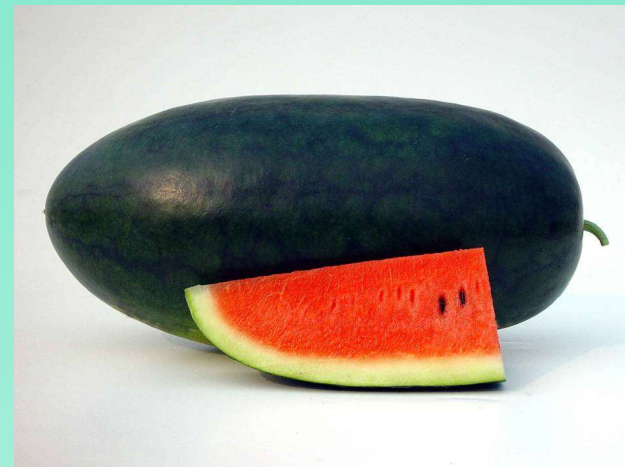
Different Types in Watermelon - SHAPE



ROUND



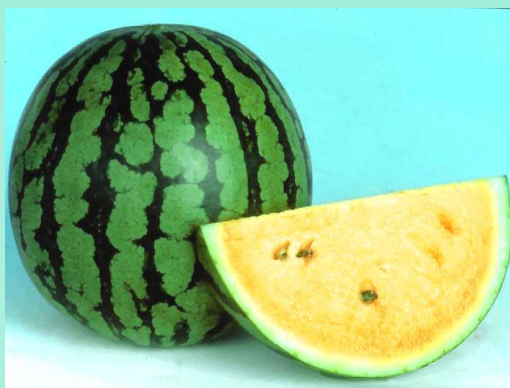
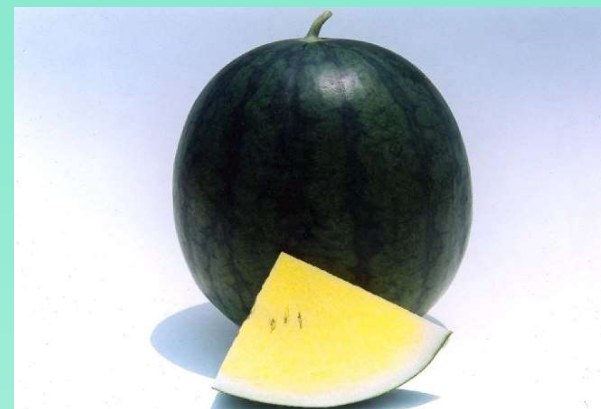
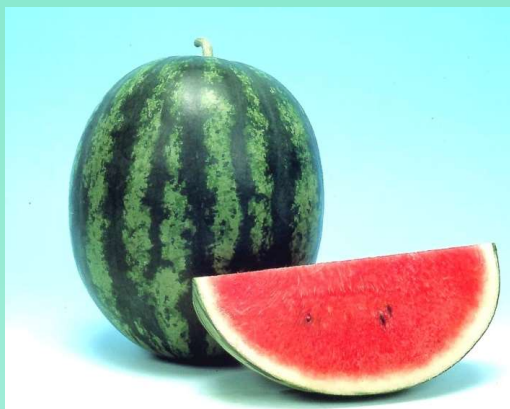
OBLONG



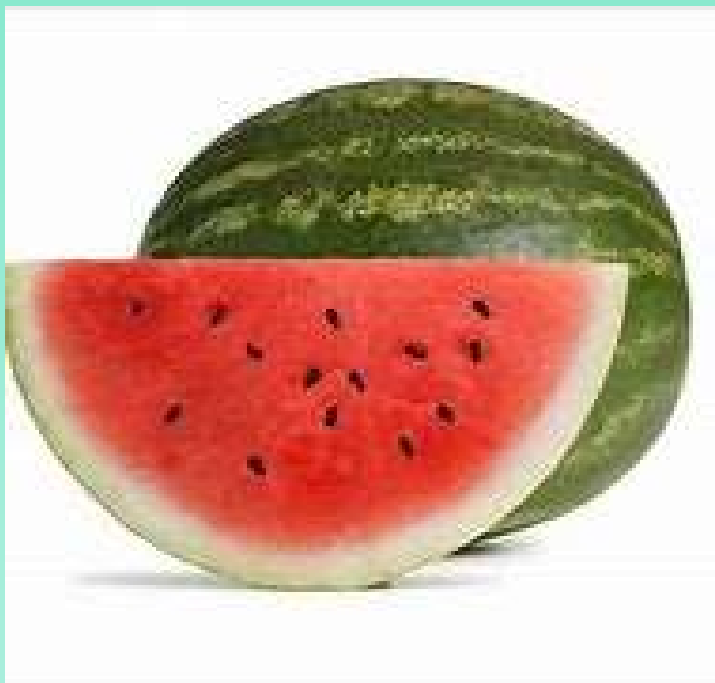
ELONGATED

Different Types in Watermelon

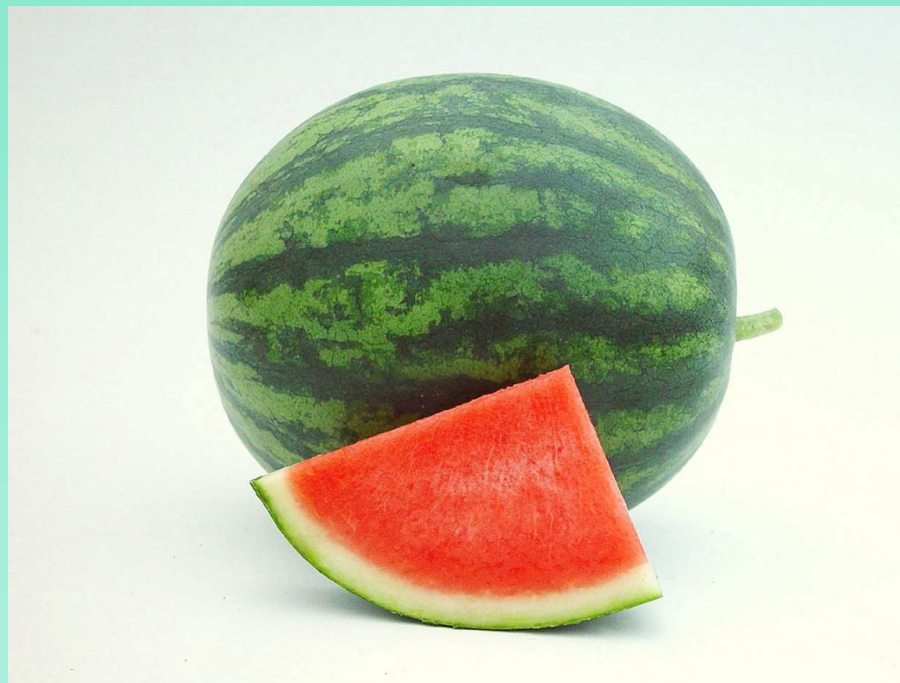
- FLESH COLOR



Different Types in Watermelon - SEEDS



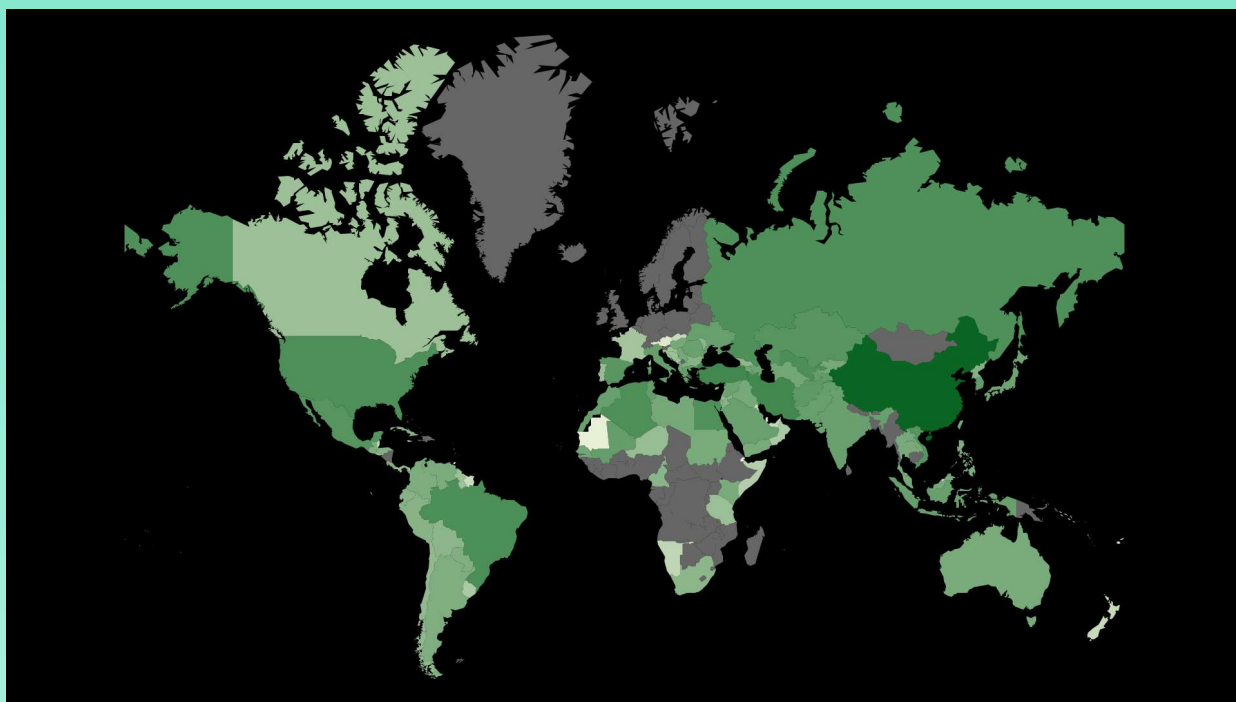
SEEDED WATERMELON



SEEDLESS WATERMELON

Worldwide Watermelon Cultivation

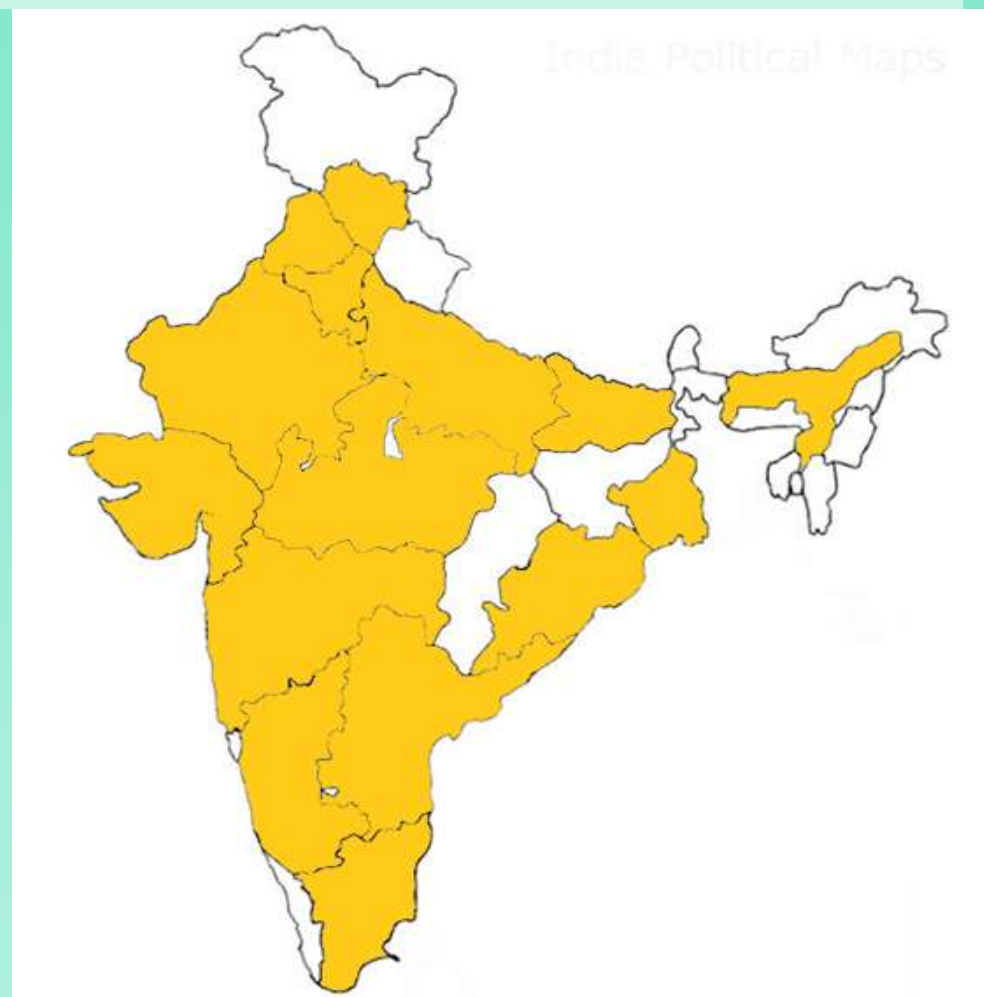
Rank	Country	Production (Tons)
1	China	79,244,271
2	Turkey	3,928,892
3	Iran	3,813,850
4	Brazil	2,090,432
5	Uzbekist an	1,976,373
6	Algeria	1,877,069
7	United States	1,823,160
8	Russia	1,757,972
9	Egypt	1,680,994
10	Mexico	1,199,648



India ranked 28th, producing approximately 3,75,000 metric tones

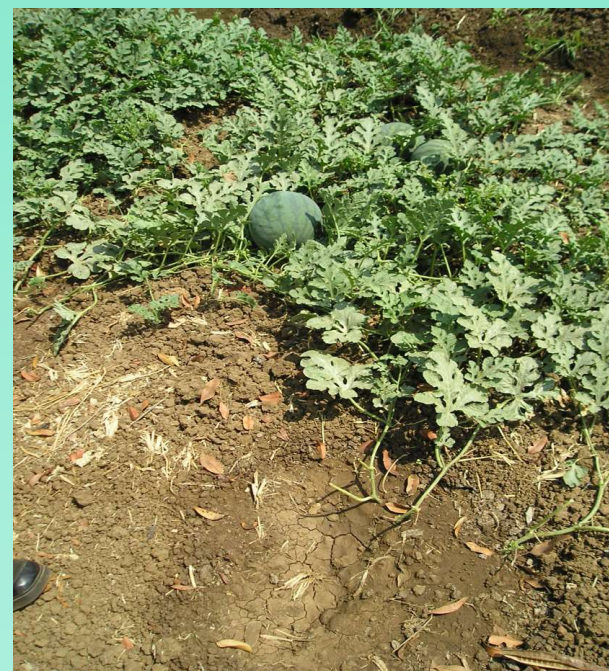
Watermelon Cultivation in India

Uttar Pradesh, Himachal Pradesh, Rajasthan, Orissa, Gujarat, Madhya Pradesh, Bihar, Punjab, Haryana, Assam, West Bengal, Karnataka, Andhra Pradesh, Maharashtra, and Tamil Nadu.



Methods of Cultivation in India

- Traditional (Old)



Methods of Cultivation in India

- Traditional (Old)



Methods of Cultivation in India - Today



Raised Beds, Mulching, Drip Irrigation

Methods of Cultivation in Taiwan

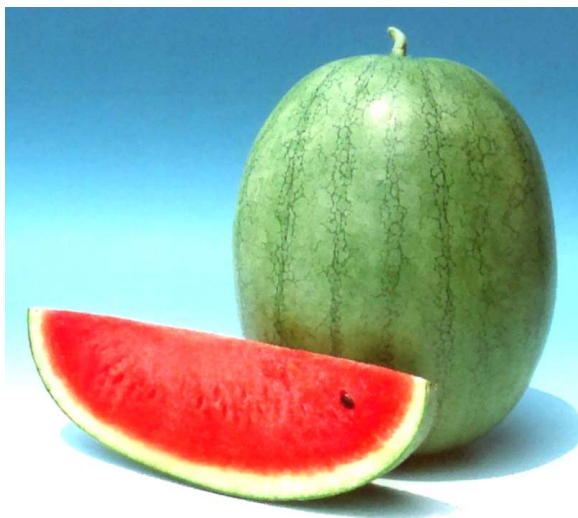


Advance Methods of Cultivation

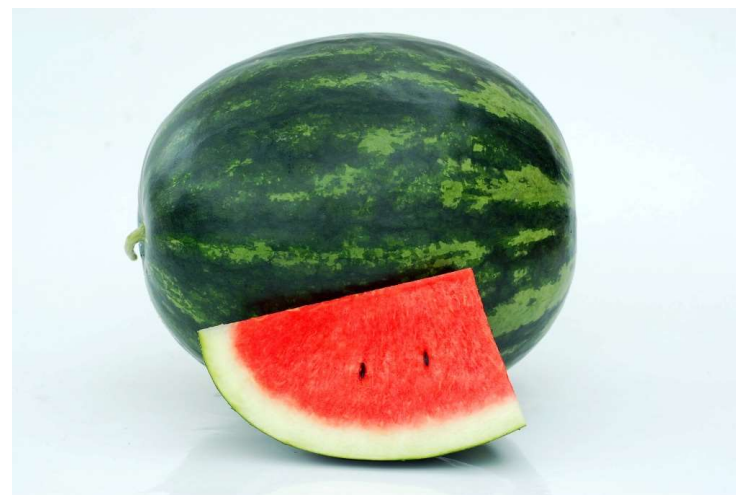


Popular Watermelon Varieties of SERKAN Seed

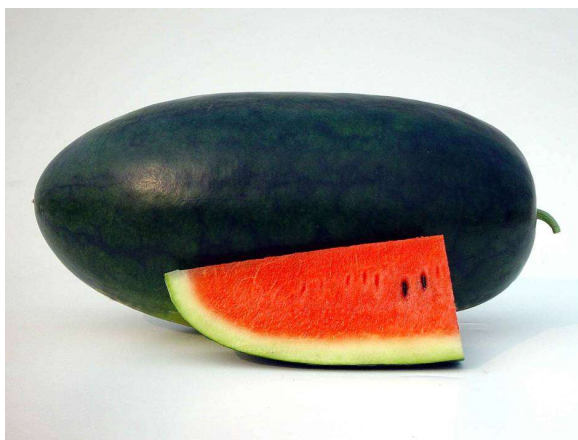
ZARA



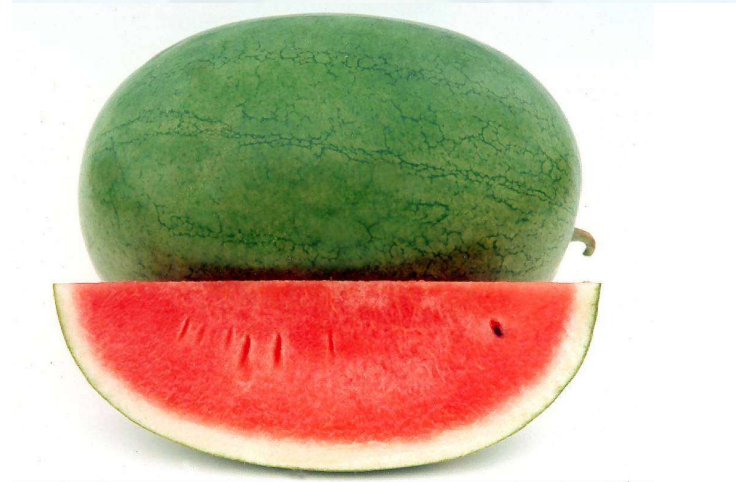
MEGANA



APSARA



LUCIA



Why Quality Production is Necessary?

- ✓ Higher Prices for Quality Fruits in Market
- ✓ Quality fruits are sold at Instant
- ✓ Even at the time of floods in market, quality fruits can be easily sold with higher price as compared to average fruits
- ✓ Quality Fruit creates Repeat Demand from consumer, thereby inducing wholesaler demanding fruits from Farmer and offering good price
- ✓ Overall Income can be much better

How can we improve the Quality?

- ☐ Best Soil Environment with Raised Beds
- ☐ High Quality Seeds/Seedlings
- ☐ Pruning Techniques for desired plant growth
- ☐ Selective & Controlled Fruit Setting
- ☐ Balanced & Timely Nutrition
- ☐ Grading & Attractive Packing
- ☐ Innovative Ways of Marketing the Fruits
- ☐ Plant Protection- Holistic Approach

Soil Bed Preparation

Soil Type for Watermelon:

- Can be grown in many types of soil ranging from sandy, medium, black, lateritic, etc.
- Best soils are Well-Drained, Sandy-loam soils
- Ideal pH is 6.5 to 7 pH & EC below 1.
- High Organic Carbon (>1%) is must.

Ploughing & Harrowing:

- Light Ploughing just to make the soil aggregates loose & crushing of clods
- Avoid Deep Ploughing (which can turn top fertile soil deep inside)
- Compost can be spread everywhere uniformly and mixed during Harrowing or later mixed during making raised beds
- Raised beds should be in North-South direction

Soil Bed Preparation



Soil Bed Preparation



Bed Methods & Spacing

Both Direction Planting



Large Size Watermelon

Row to Row: 12' X Plant to Plant: 1.5'
Plant Population: 4840



Small Size Watermelon

Row to Row: 10' X Plant to Plant: 1.5'
Plant Population: 5808

Bed Methods & Spacing

Both Side Planting



Large Size Watermelon

Row to Row: 12' X Plant to Plant: 1.5'
Plant Population: 4840



Small Size Watermelon

Row to Row: 10' X Plant to Plant: 1.5'
Plant Population: 5808

Bed Methods & Spacing

Single Direction Planting



Large Size Watermelon

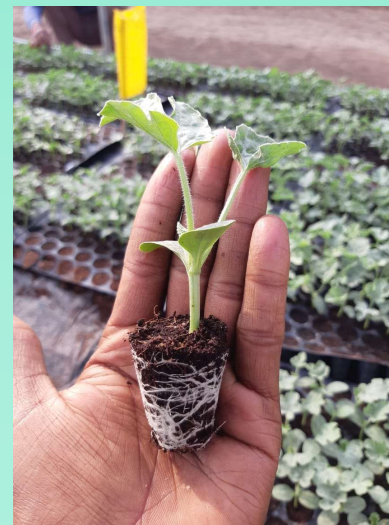
Row to Row: 6' X Plant to Plant: 1.5'
Plant Population: 4840

Small Size Watermelon

Row to Row: 5'
Plant to Plant: 1.5' X Plant Population: 5808

High Quality Seeds & Seedlings

- ❖ Uniform,
- ❖ Healthy
(Disease/Pest Free)
- ❖ 15 to 18 days old,
- ❖ Sturdy & strong stem girth

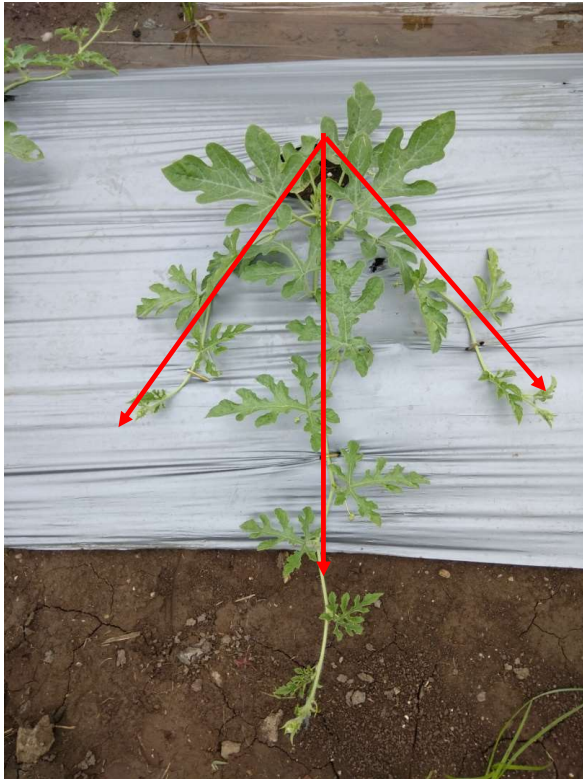


Transplanting & Aftercare



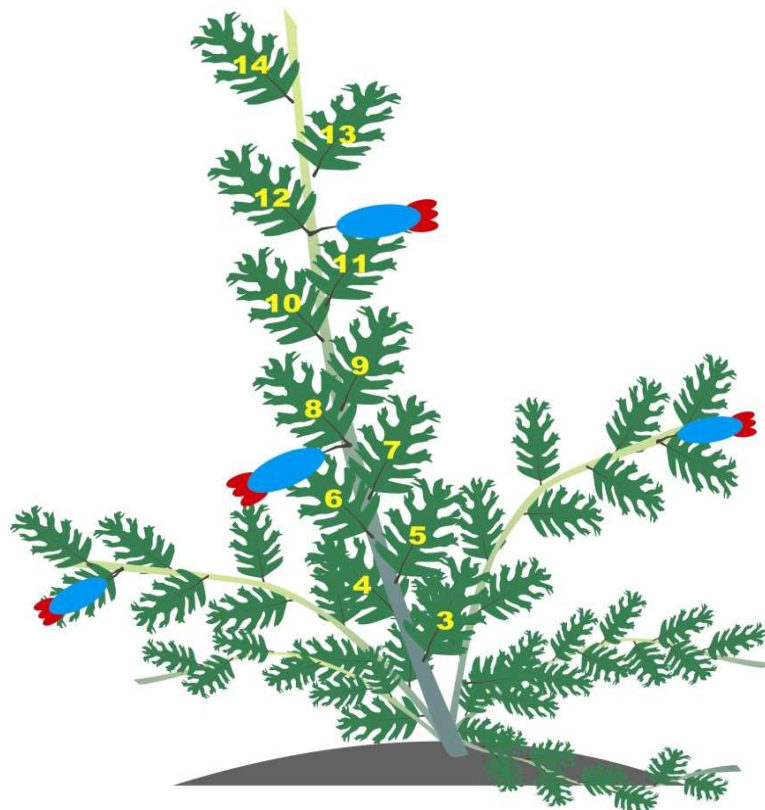
- Enough Moisture in Soil Bed during and after transplanting
- No Gap between Soil Bed & Mulching
- Daily Observation & Gap Filling

Pruning Techniques

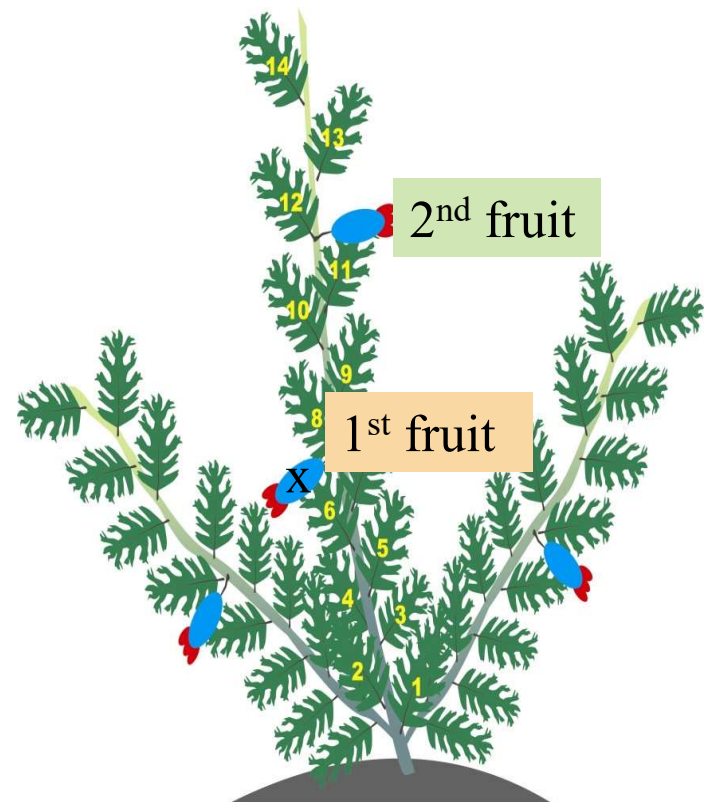


Maintaining 3 Branches
=1 main branch + 2 Side
branches.
Removing others branches

Pruning Techniques



Plant Without Pruning



Plant with 3 branches Pruning

Pruning Techniques



Controlled & Selective Fruit Setting



Remove the First Fruit (which is generally between 7th to 9th leaf)

Fruit Setting per Plant

- Large Watermelon – Select only 1 Best Fruit on the main branch
- Small Watermelon – Select 2 to 3 Best Fruits

Remove Mis-shaped, Fruit Fly affected, Diseased Fruits & retain only the best fruits in the field when they are egg-sized

Controlled & Selective Fruit Setting



Uniform Size & Shaped Fruits with Uniform Harvesting

Balanced & Timely Plant Nutrition

- ✓ Soil Testing for assessing nutrient content must be done in advance.
- ✓ Fertilizer recommendations advised below are general guidelines and shall be adjusted as per soil test results.
- ✓ Old method of giving fertilizers in 2-3 splits is now not much useful.
- ✓ As Organic Carbon had gone below 1% in most of the soils with no humus content had resulted in poor CEC/ holding capacity of soil, leaching out of nutrients.
- ✓ Central Govt. is making compulsory to use Bio-fertilizer to reduce use of Chemical Fertilizers (Urea)

Balanced & Timely Plant Nutrition

- ✓ Judicious use of Organic Manure & Chemical Fertilizers with Timely Application (as per Stage of Crop Life) is necessary for Healthy, Pest/Disease Immune, High Yielding Crop with Nutritious High Quality Fruits.
- ✓ To understand this concept it is necessary to learn the principles of Regenerative Agriculture deeply.
- ✓ Use of suitable Soil Amendments containing beneficial microbial species of Trichoderma, Azotobactor, PSB, KMB, Bacillus, Pseudomonas, Mycorrhiza, etc.

Balanced & Timely Plant Nutrition

Basal Dose for One Acre

- ☐ Fully Decomposed Organic Manure: 10 to 12 tons
- ☐ Neem Cake: 500kg

- ☐ Chemical Fertilizers:
 - 10:26:26 – 150Kg OR DAP – 100Kg + MOP – 50Kg
 - Single Super Phosphate – 50Kg
 - Muriate of Potash – 25Kg
 - Mix Micro-Nutrients – 5 to 7Kg

Balanced & Timely Plant Nutrition

Fertigation Schedule (through Drip)

Growth Stage	DAT	Fertilizer	Total Qty. (Kg/acre)	Dose (Kg/acre)	Splits	Remark
After Transplanting (3-4 leaf)	3 to 9 days	19-19-19	5Kg	1.5 to 2Kg	3	3 days gap
Vegetative Growth	10 to 30 days	19-19-19 +	20Kg	2Kg	10	Mixing, Alternate day
		Urea	40Kg	4Kg		
		Calcium Nitrate	15Kg	2.5Kg	6	Weekly twice
Flowering Stage	27 to 35 days	12-61-00	20Kg	5Kg	4	Alternate Day
		00-52-34	10Kg	2.5Kg	4	Alternate Day
Fruit Development-Primary	35 to 45 days	13-40-13	18Kg	6Kg	3	Alternate Day
Fruit Development-Secondary	45 to 65 days	13-40-13	12Kg	3Kg	4	Weekly once
		00-00-50 +	100Kg	5Kg	20	Mixing, Every day
		Urea	20Kg	1Kg		

Balanced & Timely Plant Nutrition

Secondary Nutrients – Ca, Mg, S

- ✓ Mostly Ca & Mg are available in soils abundantly. Also we are providing them partially in above mentioned dose.
- ✓ Calcium is required throughout the crop life, but requirement is more during the initial Root Development stage & Primary Fruit Development stage.
- ✓ Calcium is absorbed only through roots (Xylem), for which active soil microbiology is very crucial. Also Boron is required for Ca absorption.
- ✓ Magnesium is important for Photo-synthesis as well as other biochemical process in the plant.
- ✓ Sulphur helps in much needed enzyme formation.

Balanced & Timely Plant Nutrition

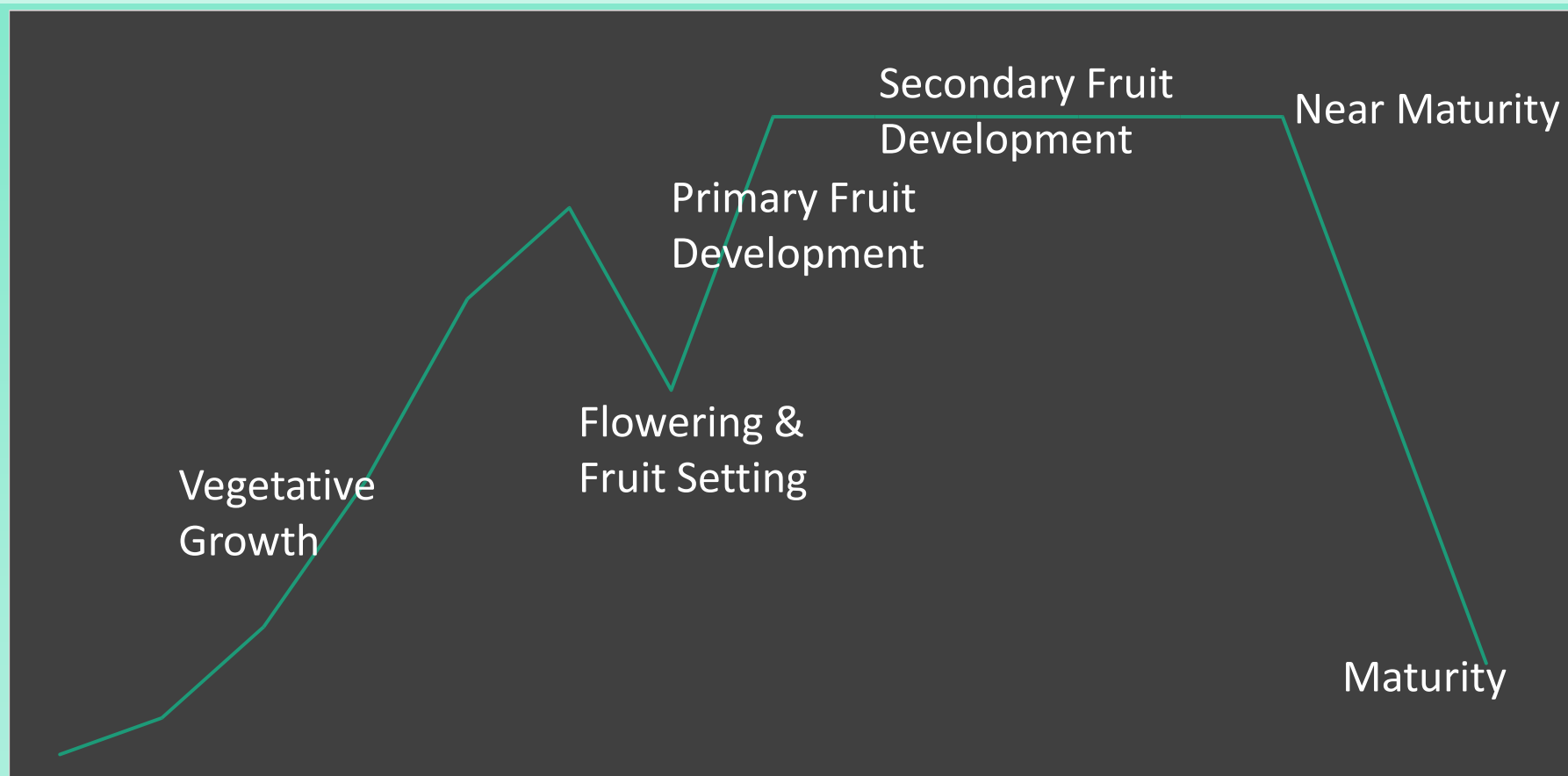
Elements: Fe, Zn, B, Cu, Mo, Co, Ni

- All these elements play important role in plant's bio-chemistry & impacts on yield and plant health
- Also these elements helps for growth of soil micro-organisms
- As most soils are depleted of these micro-nutrients, we need to provide them in sufficient quantity
- Use high quality fertilizers having sufficient content of all these micronutrients

- Total Quantity of Mix Micronutrients required: **15 to 20 Kg per acre**
- **5 to 7Kg in Basal Dose** (can be mixed with Organic Manure)
- **7 to 10Kg in Fertigation** – 1Kg each every week
- **3 Kg by Foliar Spray** – 100g to 300g every week

Irrigation

Irrigation



Crop Life (Duration)

Stages of Fruit



Harvesting

Harvesting at **Mature stage**, neither Immature Nor Over-mature is the Key.

Duration depends on Type of watermelon,
Season, Variety, etc.

Yield:

Big Size Watermelon – 25 to 35 tons/acre

Icebox Watermelon – 20 to 25 tons/acre

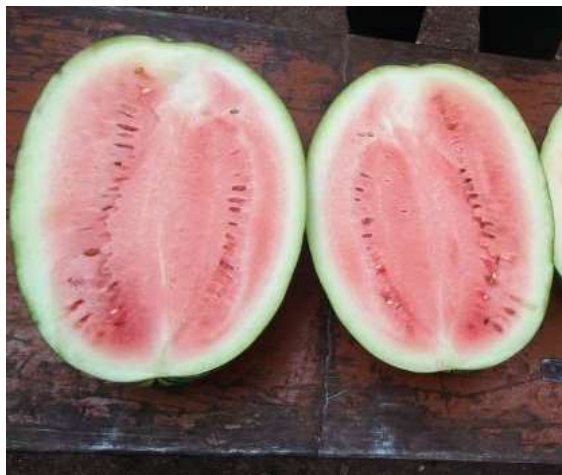


Maturity Signs:

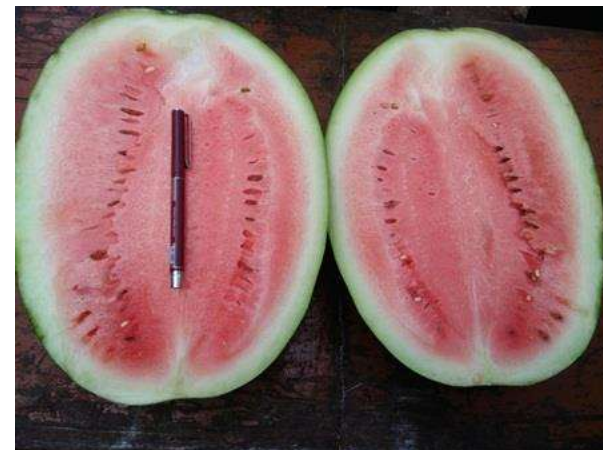
- ✓ Tapping Sound – Fore-Head : Immature, Chest: Mature, Stomach: Over-Mature
- ✓ Drying of Tendril near fruit
- ✓ Yellowing of rind portion touching the ground
- ✓ Seeds change to black / brown colour

Harvesting as per Market Need

60%
Maturity



70%
Maturity



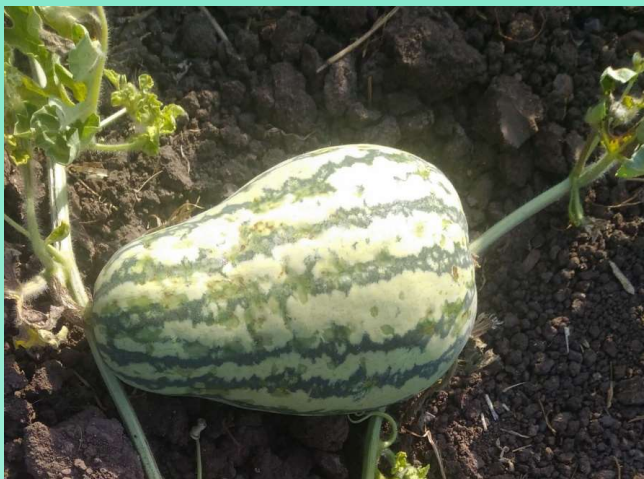
80% Maturity
for Export/
Long
Distance
Market



90-95%
Maturity
Local
Markets



Mis-shaping Problem in Watermelon



- Mainly Occurs due deficiency of Ca, B, K & Water. Another reason is Poor Pollination
- Optimum uptake of Ca & B necessary during Primary Fruit Development Stage (Active Soil Microbiology)
- Sufficient Irrigation & Potash necessary during Secondary Fruit Development Stage (don't let soil bed dry)
- Ensure proper pollination by Insects, remove mis-shaped fruit at early stage (cricket ball size)

Grading and Packing



Grading and Packing



Grading and Packing



Marketing of Fruits- Wholesale/Retail Market



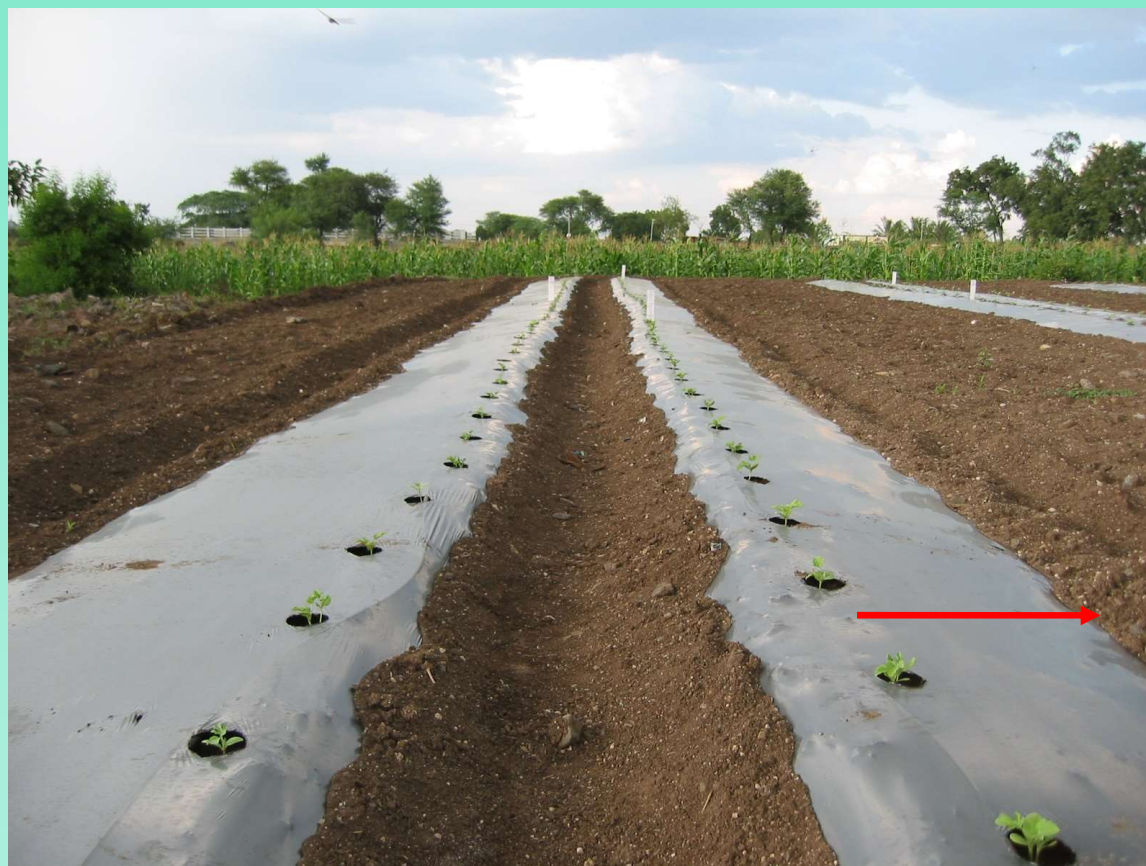
Export of Suprit Fruits



Rainy (Off-Season) Cultivation



- Choosing field with good drainage
- More Row to Row Spacing – 15'
- Bed Height – 1.5'
- Covering Maximum Bed Width with Mulching with sloppy Beds
- Drainage Channel between rows, Also drainage from sides of the plot



Rainy (Off-Season) Cultivation



Rainy (Off-Season) Cultivation



Rainy/Winter (Off-Season) Cultivation



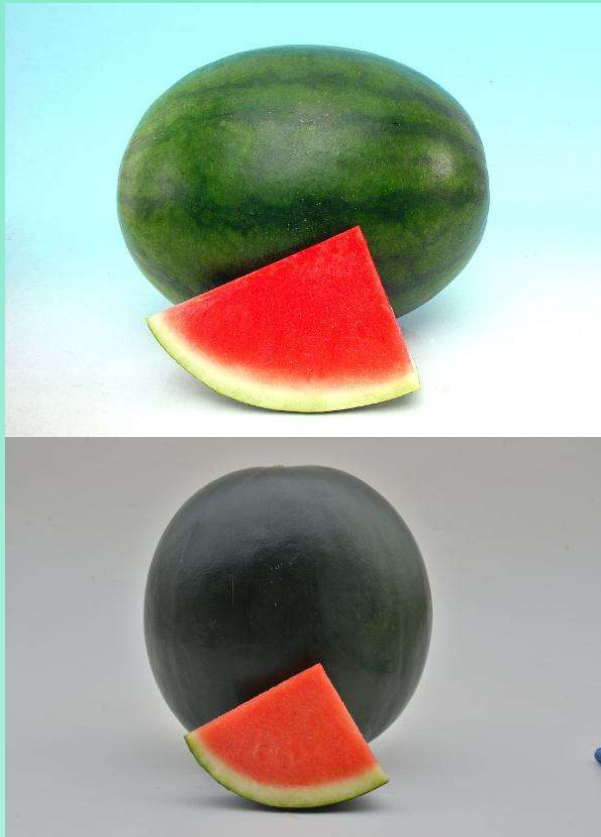
Low Poly Tunnels to protect
from Rains/ Cold Weather

Winter (Off-Season) Cultivation



Crop Cover (Non-woven Cloth) helps to increase the temperature slightly & also protects from Sucking Pests

Seedless Watermelon Cultivation



- ❑ Seedless Watermelon – can be called as “Less Seed” as Pseudo Seeds (white coloured) are found, but they are edible
- ❑ Gets High Value than seeded watermelon due to their specialty
- ❑ Needs Specialized Cultivation Technique to grow
- ❑ Needs more ‘Uniform Weather Conditions (Temperature)’ during fruit development stage
- ❑ Few Black Seeds may develop occasionally

Seedless Watermelon Cultivation

Seed Germination

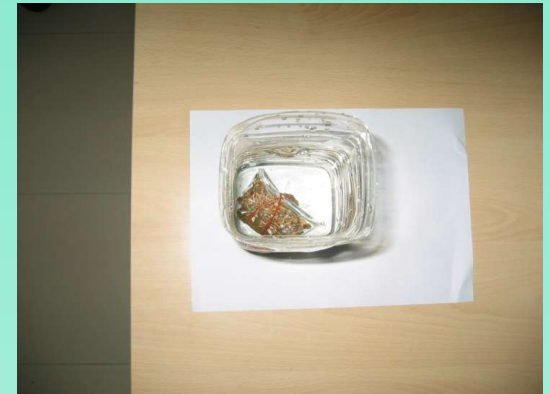
Seed Germination is a challenge in Seedless Watermelon. The seed coat of triploid is usually thicker and the kernel inside the coat is smaller and therefore the germination of triploid seeds is poorer and weaker than common watermelon seeds.

Seedless Watermelon Cultivation

Process of Germination



Keep the Seeds in pre-holed plastic bag



Soak the seeds for 30 minutes

Seedless Watermelon Cultivation



Keep the seeds in wet towel & wrap it



Keep the Bulb (40W) 2' away from seeds

Check every 6
hours that towel is
sufficiently moist



Keep the Temperature around
30°C & incubate for 24 to 30 hours

Seedless Watermelon Cultivation



- Grow 10% plants of Pollinator Variety (any Big Watermelon Seeded variety)
- Transplant along with Seedless Watermelon in the field

Seedless Watermelon Cultivation

Female Flower



Male Flower



As the Male of Seedless Watermelon is Sterile, Need to Pollinate with Male from Seeded Watermelon variety

Seedless Watermelon Cultivation



Hand Pollination

- As natural cross pollination is not so sure, it is recommended to do 'Hand Pollination'
- Pollinate at morning hours (7 to 9 AM) when there is no dew

Seedless Watermelon Cultivation



Mini Watermelon – A Future Trend



500g to 1Kg Fruit



Future Cultivation - Grafting Technique

Need of Grafting in Watermelon

- ✓ To increase the Disease Resistance against Soil borne diseases – Fusarium, Root Rots, etc.
- ✓ To increase the productivity – root-stocks are more efficient in water & nutrient uptake



Squash as Root Stock



Piercing with special needle

Future Cultivation - Grafting Technique



Scion of desired Variety



Grafting



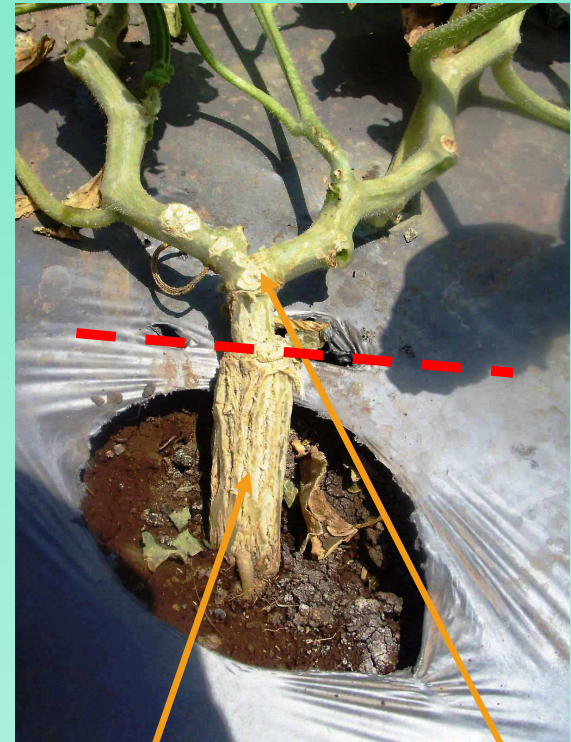
Rootstock

Scion

Future Cultivation - Grafting Technique



Incubation Chamber



Rootstock

Scion

Novelty – Shaping the Watermelon



Major Pests



Thrips



White fly



Major Pests

Fruit Fly



Preventive Measures

- ✓ Using Pheromone Traps surrounding the plot
- ✓ Dusting 5% Malathion for controlling Pupae in soil

Major Pests

Nematodes



Preventive Measures

- ✓ Integrated soil health management
- ✓ Proper Crop Rotation (Marigold)
- ✓ Using Fungi & Bacteria – Paecilomyces, etc.

Major Diseases

Downy Mildew

Symptoms:

- Down word side water-soaked spot are appear
- Upper surface Yellow spot are appear.



Major Diseases

Downy Mildew

Favourable Environment:
Temperature: Around 24°C,
Relative Humidity: Above 80%

Disease Spread: By Air (from
nearby fields)

Precautionary Measures:

- ✓ Increasing Plant Spacing
- ✓ Remove infected plant parts / leaves
- ✓ Proper weed control
- ✓ Care about water management.
- ✓ Spraying combination of
Edible Oil: Detergent: Water
as 9ml+1gm+1 lit

Major Diseases

Downy Mildew

Preventive	Curative
Mancozeb 2g/Lit	Acrobat (Dimethomorph) 1g/Lit
Saff (UPL) 2g/Lit	Amistar (Azoxystrobin) 1ml/Lit
	Cabrio Top (BASF) (Polyram and Pyraclostrobin) 1gm/lit

Major Diseases

Powdery Mildew

Symptoms:

- Whitish Powder appear on upper & lower leaf surface
- Upper surface Yellow spot are appear.



Major Diseases

Powdery Mildew

Favourable Environment:
Temperature: Around 15-27°C,
Dry Climate

Disease Spread: By Air (from
nearby fields)

Precautionary Measures:

- ✓ Keeping proper spacing for better aeration
- ✓ Remove infected plant parts / leaves
- ✓ Proper weed control
- ✓ Spraying combination of
Edible Oil: Detergent: Water
as 9ml+1gm+1 lit

Preventive	Curative
Contaf Plus 1gm/Lit	Score (Difenoconazole) 1ml/ Lit
Mancozeb 2gm/Lit	Amistar (Azoxystrobin) 1 ml/ Lit

Major Diseases

Gummy Stem Blight

Symptoms:

- Circular tanned spot appear of leaf
- Stem Canker is observed
- Gum exudates from stem

- Primary Infection from debris in soil or infected seedlings or weeds
- Infection spreads by splashing water (rains)



Major Diseases

Gummy Stem Blight



Major Diseases

Gummy Stem Blight

Precautionary Measures:

- ✓ Field sanitation is necessary to avoid GSB
- ✓ Soil Fumigation.
- ✓ Using fully decomposed FYM to improve soil fertility.
- ✓ Using Biological Amendments to improve the soil health / antagonistic to pathogens.

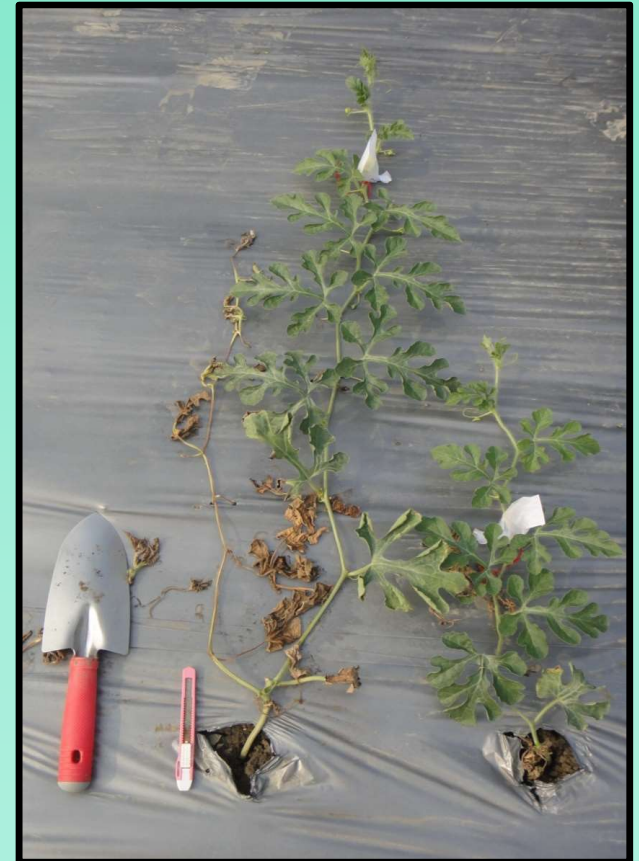
Preventive	Curative
Roko (Thiophanate methyl) 3% for Pasting the stem	Score (Difenconazole) 1ml/Lit
Spray VALIDA + Streptoclyne	Folicur (Tubuconazole) 1ml/Lit
	Cabrio Top 1ml + Amistar or Folicur 1gm

Major Diseases

Fusarium Wilt

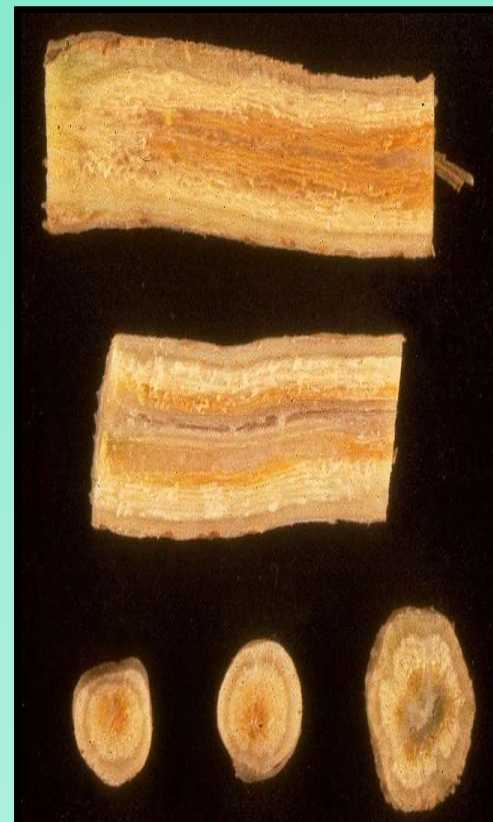
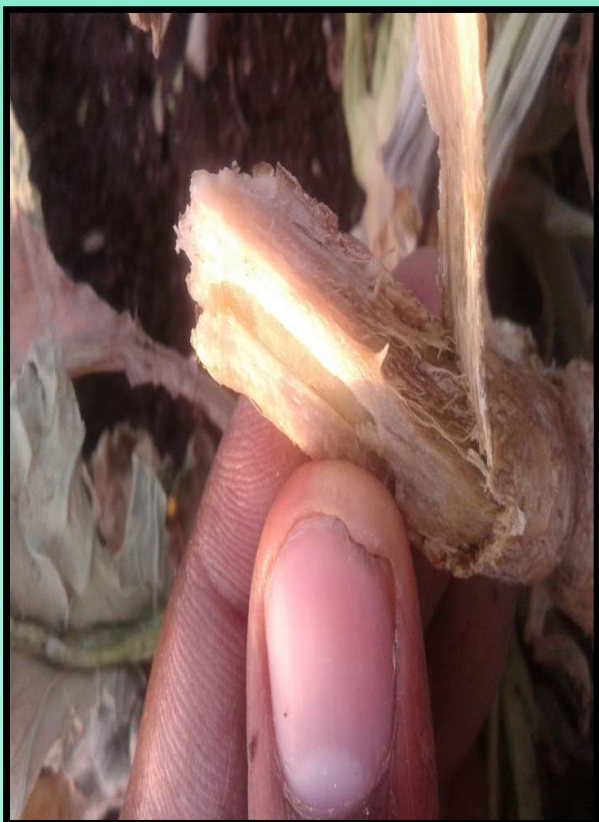
Symptoms:

- Dying of one branch & later the entire plant
- Vascular Discoloration



Major Diseases

Fusarium Wilt



Major Diseases

Fusarium Wilt



Wilting in Nursery
Stage

Major Diseases

Fusarium Wilt

There is No Curative Measure for Fusarium Wilt

Precautionary Measure

- ✓ Use Disease free seeds and seedlings
- ✓ Crop Rotation
- ✓ Soil Health – Drainage, Microbiology, Soil solarization
- ✓ Grafting Technique
- ✓ Biological method – drenching of Trichoderma spp., others
- ✓ Chemical method – drenching Ridomil Gold @ 3g/l

Major Diseases

Vine Decline

Symptoms:

- Few plants show dying/wilting symptoms after fruit setting
- Infection may spread to whole plot before harvesting



Major Diseases

Vine Decline

There is No Curative Measure for Vine Decline

Precautionary Measure

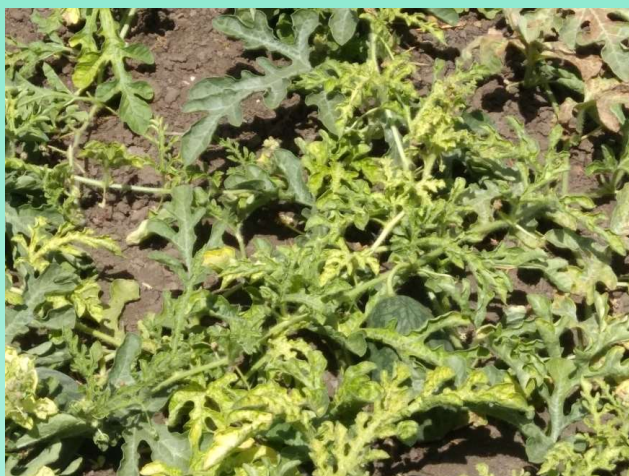
- ✓ Use Disease free seeds and seedlings
- ✓ Crop Rotation
- ✓ Soil Health – Drainage, Microbiology
- ✓ Soil solarization
- ✓ Grafting Technique
- ✓ Biological method – drenching of *Trichoderma* spp., others
- ✓ Chemical method – drenching Ridomil Gold @ 3g/l, Score 0.5ml + Aliate 1g per litre

Major Diseases

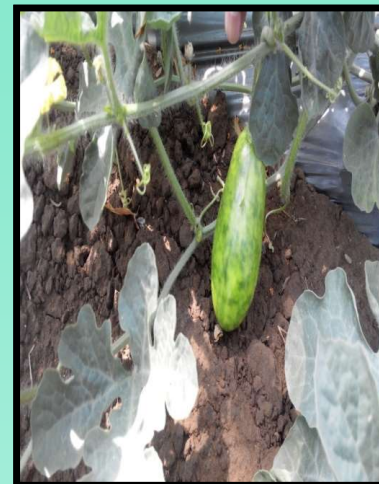
Cucumber Green Mottle Mosaic Virus



Primary Stage



Last Stage



Symptoms on
Fruit



Vector –
White fly

Major Diseases

Watermelon Silver Mottle Virus



Vector – Thrips

Major Diseases

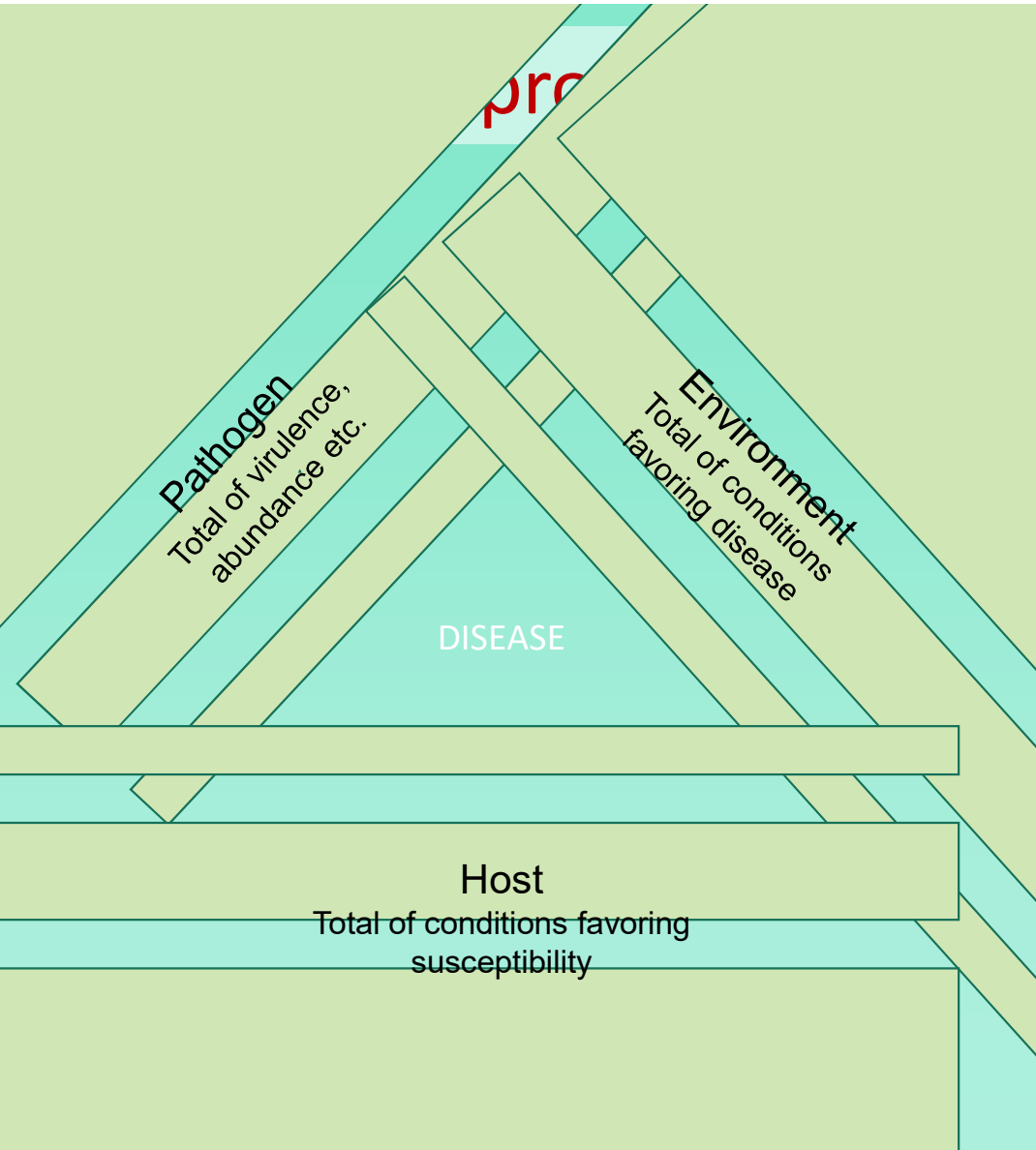
Viral Diseases

There is No Curative Measure for any Viral Diseases

Precautionary Measures:

- Use virus free seeds and seedling
- Control the vector (Mainly **White fly, Thrips and Aphids**)
- Use **Crop Cover** after Transplanting
- Control weeds and alternative host
- Maintain Plant's Immunity

- ☐ We know the Disease
Host, Pathogen & Env.
- ☐ Pathogen - Due to Intensive
Agriculture; Pathogens are always
present, Parallel Hosts are available
- ☐ Environment – We cannot able to control
much
- ☐ Host- We try to choose Resistant/Tolerant



Plant Protection – An Holistic Approach

Increasing Immunity of Plants

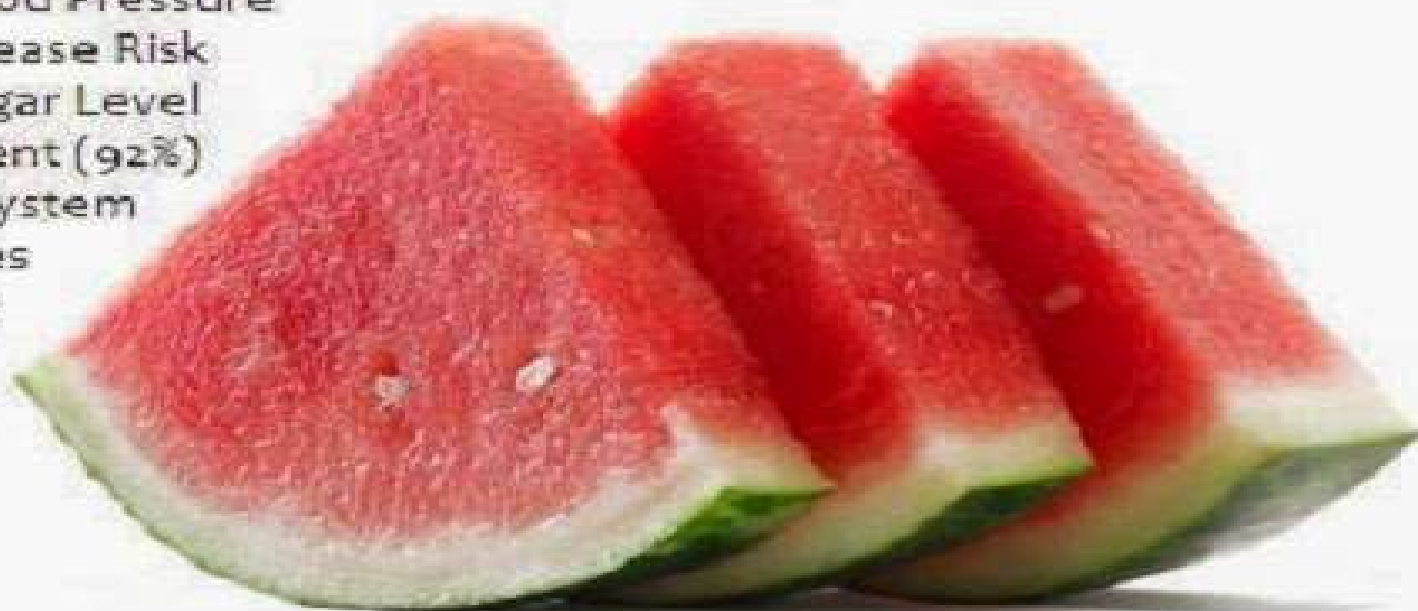
- ❖ Improving Soils – Increasing Organic Carbon Content & Replenishing with Beneficial Microbes
- ❖ Intercropping & Mix Cropping – Crops from different family
- ❖ Cover Crop – always cover the soil with some kind of green cover
- ❖ Increasing Rate of Photosynthesis – Water, CO₂, Mineral Nutrients
- ❖ Balanced & Timely Nutrition
- ❖ Following IPM Methods for Plant Protection

Can learn in details from Regenerative Way of Agriculture

10 Health Benefits of...

Watermelon

1. Highest Alkalising Fruit!
2. Reduces High Blood Pressure
3. Reduce Heart Disease Risk
4. Reduce Blood Sugar Level
5. HIGH Water Content (92%)
6. Boosts Immune System
7. Strengthens Bones
8. Produces Energy
9. Cleans Kidneys
10. Fights Cancer



Serkan Seed - Watermelon World



Happy Farmer & Happy Consumer is Our Goal

