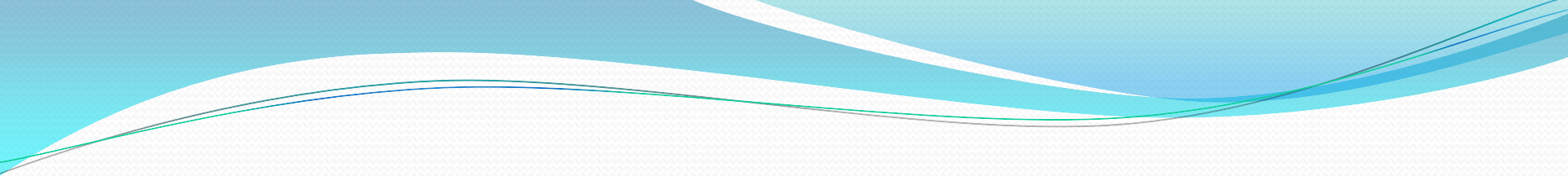# SOME IMPORTANT COTTON DISEASES and CONTROL

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NAZİLLİ-AYDIN/TURKEY

➢**World cotton area in 2010/11 is forecast at 32.9 million hectares, up 9 percent from the previous year and similar to the pre-crisis cotton area.**

➢**World cotton production is forecast to increase to 113.9 million bales in 2010/11, up 11 percent from 2009/10.**

➢**Yields are 739 kilograms per hectare in 2009 and compared to the 5-year average of 759 kilograms.**
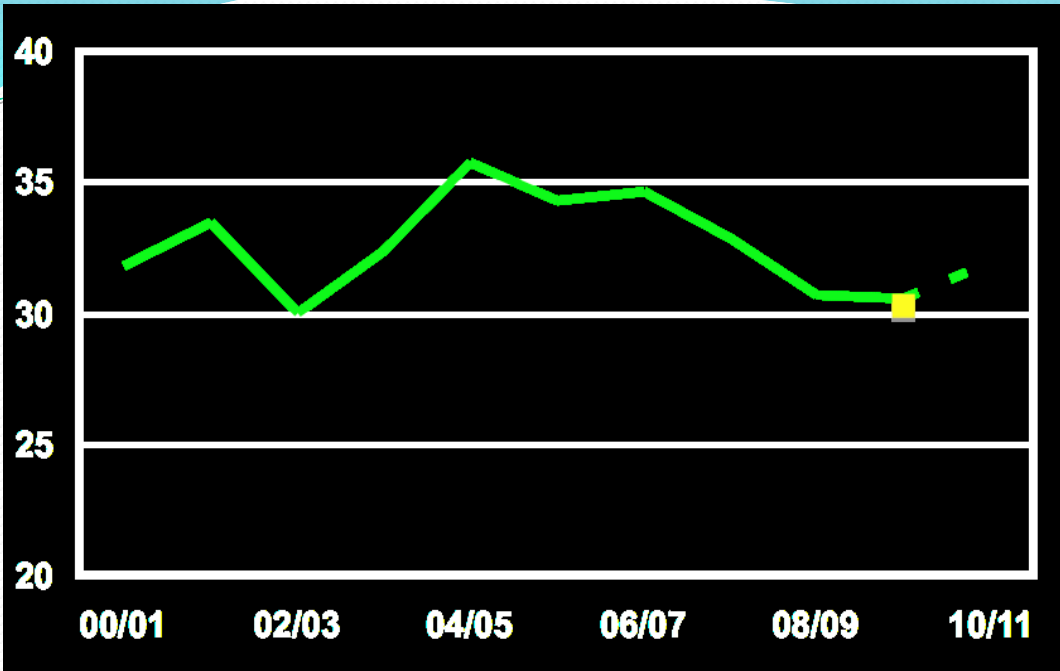
World Cotton Area (hectar)
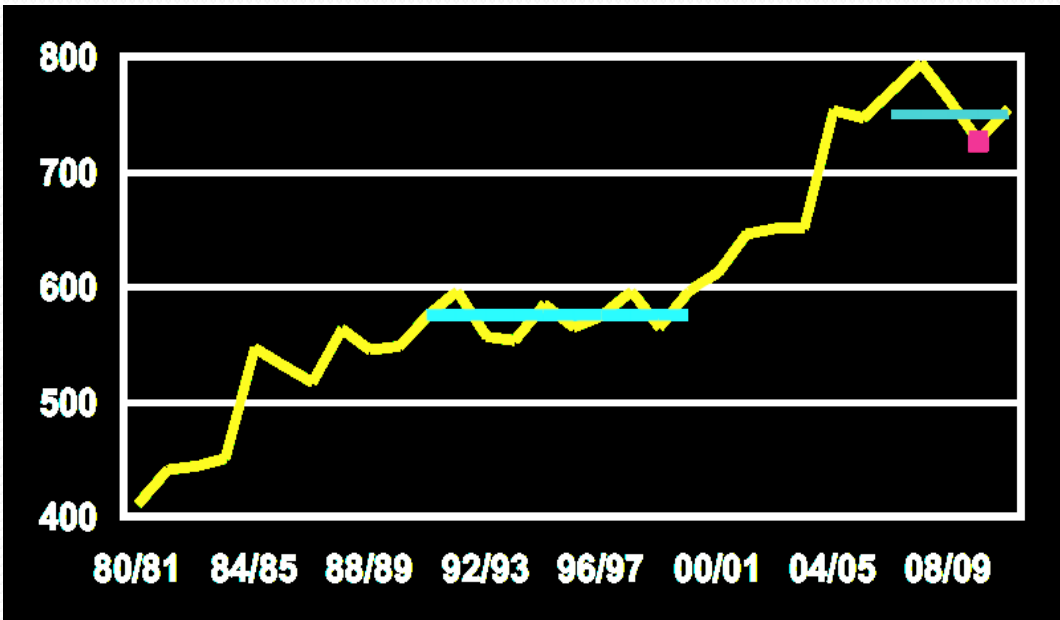
World Cotton Yields (kg/hectar)

COTTON PRODUCTION AREAS IN TURKEY

TOTALLY	
AREA	573.000 HA
SEED COTTON YIELD	2.580.000 TONES
LINT YIELD	1800 KG/HA

Aegean Region

Mediterranean Region

Southeast Anatolia Region
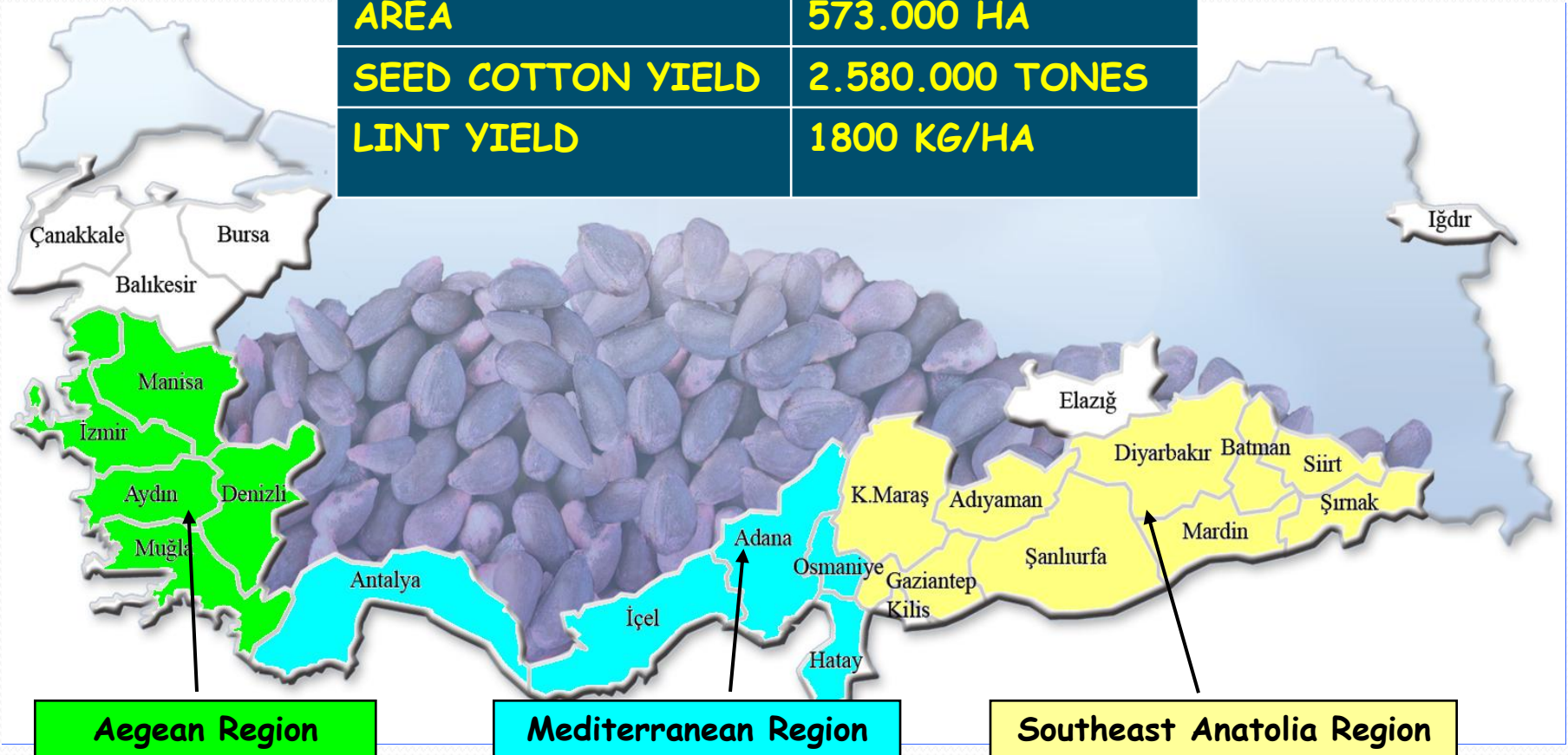
(Anonymous, 2011a)

-Cotton has long bearing period and the habit of growing infinitely.

-In the lengthy bearing period of cotton, it is often damaged by various plant diseases and insect pests.

Classic Fusarium wilt symptoms
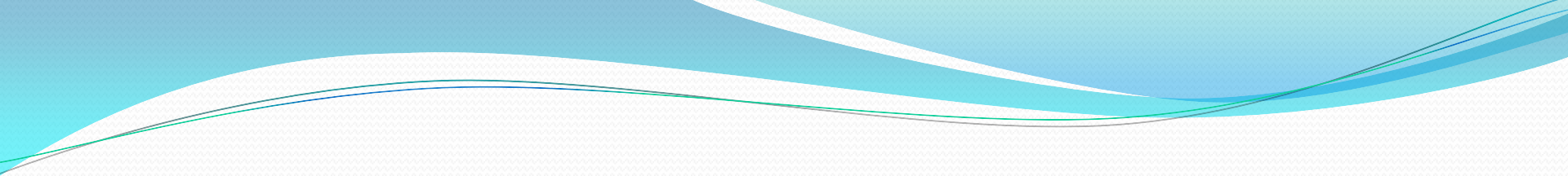
At Present yielding condition,

-The economic loss of cotton will be <u>5 %-15 %</u>

due to plant diseases and insect pests.

-If no prevention and control measure is taken,

the loss can be <u>30 %-50 %.</u>

-A few plant diseases and insect pests can

cause the loss of above <u>80 %.</u>

-Since the pesticide is invented, it plays an important role on preventing and controlling plant diseases and insect pests, efficiently controls the damage of plant diseases and insect pests and increases the output of crops.

-But as the pesticides are applied in long term and big volume,

The Ecological balance is destroyed and the environment is polluted.

-This leads to the rampancy of plant diseases and insect pests and increases the difficulty of prevention and control.

-Therefore, the prevention and control of plant diseases and insect pests of crops must be comprehensive, especially that of cotton, because the plant diseases and insect pests of cotton is severe, and the dosage of pesticide is great.

➢Cotton is susceptible to a variety of plant pathogens and many of the most important cotton diseases like bacterial blight, Fusarium and Verticillium wilt, damping-off, leaf curl virus and various boll rots are widely distributed in the cotton-growing areas of the region.

➢Cotton diseases can adversely affect seed quality. Damping-off, bacterial blight and Fusarium wilt diseases are seed-borne.

➢If seed multiplication blocks get infected with the pathogen one or both of these diseases, serious yield losses can be expected during the following season.

➢The effect of diseases on cotton yield and quality is usually underestimated.

➢ There exists a misconception among farmers and even extension officers that it is possible to "live with" cotton diseases

SOME IMPORTANT COTTON DISEASES and CONTROL

1. Verticillium Wilt (*Verticillium dahliae* Kleb.)

2. Cotton Seedling Diseases (*Rhizoctonia solani*, *Pythium* spp., *Fusarium* spp.)

3. Fusarium Wilt (*Fusarium oxysporum* forma specialis *vasinfectum)*

4. Cotton Bacterial Blight (*Xanthomonas axonopodis* pv. *malvacea)*

5. Cotton Leaf Curl Virus

6. Cotton Anthracnose (*Glomerella gossypii* Edgerton)

1. Verticillium Wilt (*Verticillium dahliae* Kleb.):

-Verticillium wilt, caused by the <u>soil-inhabiting fungus</u> *V. dahliae* Kleb. is one of the most important diseases of cotton and causes great economic losses.
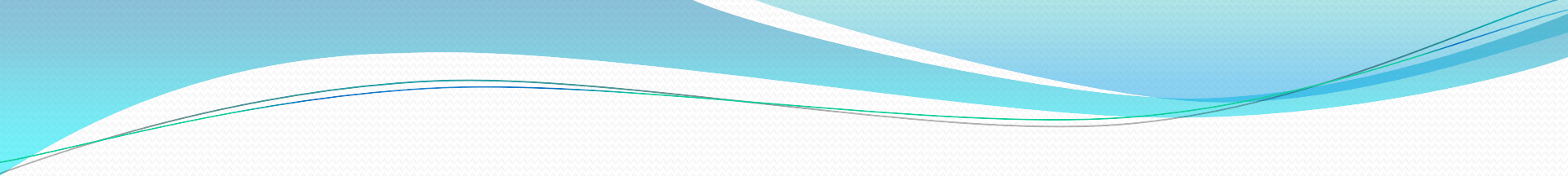
-The disease is most severe during <u>cool to warm weather</u>, but not as prevalent <u>in hot weather</u>.

-The life cycle of *V.dahliae* can be divided into dormant, parasitic, and saprophytic stages.
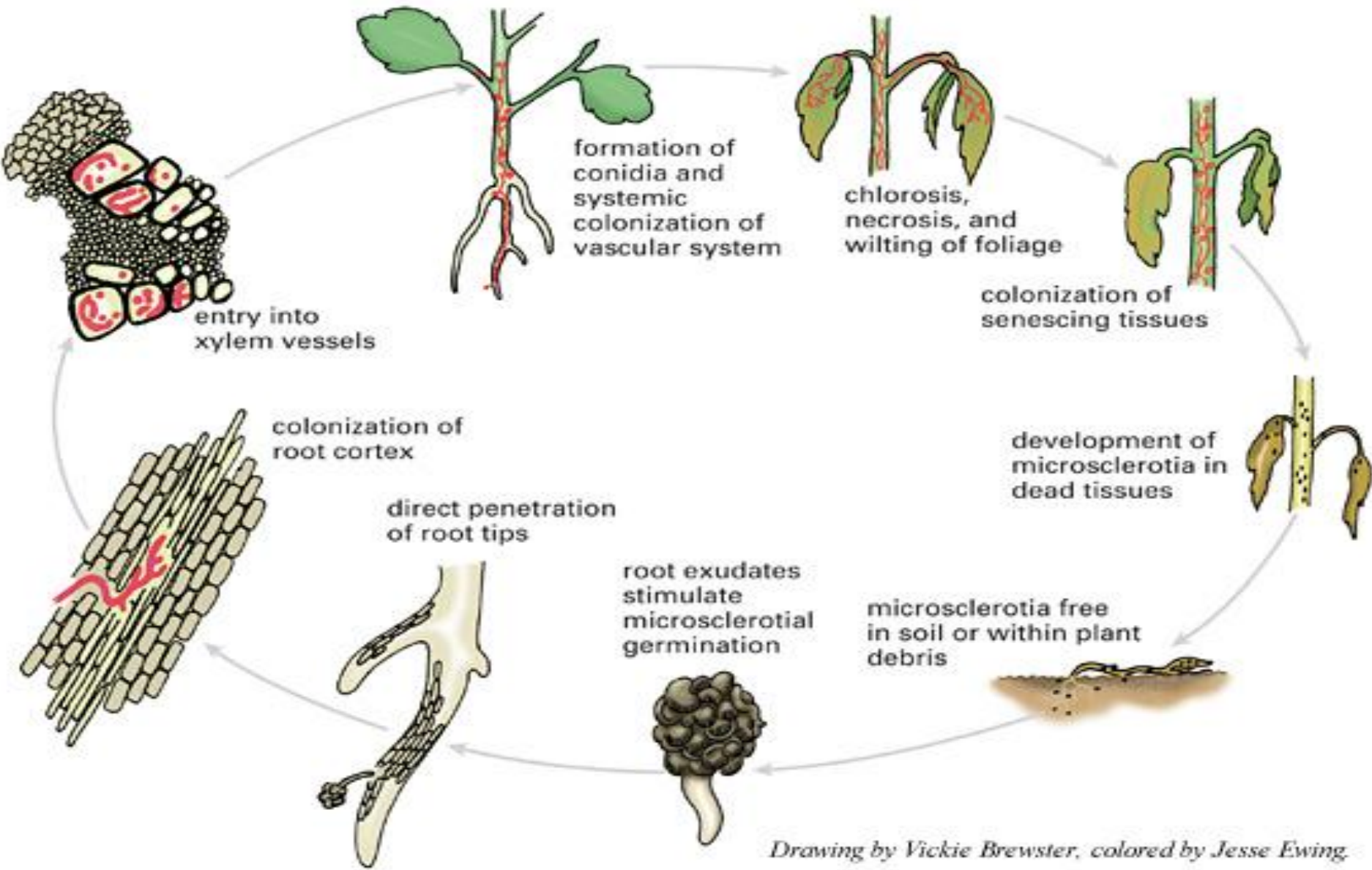
Life Cycle of *Verticillium dahliae* Kleb. on Cotton

-The first noticeable symptoms of Verticillium wilt are reduced plant

growth rate, slight to moderate epinasty and a change in leaf color.

-Cholorotic and necrotic mottling are especially apparent on the

older leaves and less severe on younger ones.

-The fungus produces toxins that cause <u>tyloses</u> or gums to form in

the vascular tissues, resulting in a greatly decreased flow of water

from the roots to the foliage

Cholorotic and necrotic mottling between the main veins and on margins of a cotton leaf

(left) Healthy cotton stem, (right) Dark brown vascular discoloration in cotton stem
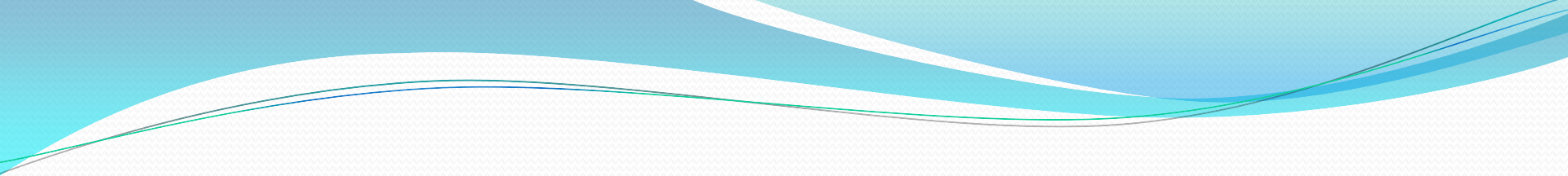
Cotton plant damaged by Verticillium wilt disease

Control Measures:
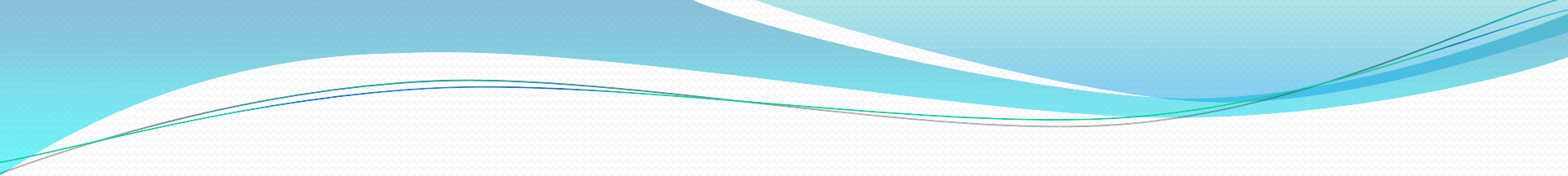
a. Growing adapted resistant cultivars

b. Crop Rotation (corn, wheat, soybeans etc.)

c. Balanced fertilization and irrigation

d. Control of weeds

e. Sanitation

f. Deep plowing

g. Biological control

(Treated seed with bacterium *Pseudomonads* and fungus *Trichoderma* spp.)

2. Cotton Seedling Diseases (*Rhizoctonia solani*, *Pythium* spp., *Fusarium* spp.):

-Several species of fungi can cause seedling disease, but the primary

agents are *Rhizoctonia solani*, *Pythium* spp., and *Fusarium* spp.

-These disease causing organisms can attack the <u>seed before or at</u>

<u>germination.</u>

-Symptoms include seed decay, decay of the seedling before emergence,

partial or complete girdling of the emerged seedling stems, and seedling

root rot.

-Seed and seedling disease is characterized by <u>a soft, watery rot.</u>

-Damaged seedlings that emerge are pale, stunted, slower growing and sometimes die within a few days. Examination of infected Seedlings.

-May reveal dark lesions on the stem and root.

-Often the taproot is destroyed, and only shallow-growing lateral roots remain to support the plant.

-The "sore shin" phase of seedling disease is characterized by

reddish brown, sunkenlesions at or below ground level. These

lesions enlarge, girdle the stem and cause it to shrivel.

-Seedling diseases do not usually kill the entire seedling

population, but rather result in uneven, slow growing stands with

skips in the rows.

Damping-off on cotton (post-emergence)   Dark lesion on cotton root and stem

Poor stand caused by damping-off

Control Measures:

a. Cultural Control:

-Always use the **highest quality seed** you can afford.

-Don't plant deeper than 2 inches because excessive depth delays emergence and exposes more hypocotyl surface to invasion by fungi.

-Soil that is too wet at planting or during germination favors seedling diseases.

-To avoid excess moisture, allow preirrigated beds to drain adequately before planting,

-Rotate cotton with wheat, maize etc to reduce inoculum of *Rhizoctonia*

and *Pythium* spp.

-Balanced fertilization and irrigation.

b. Biological Control:

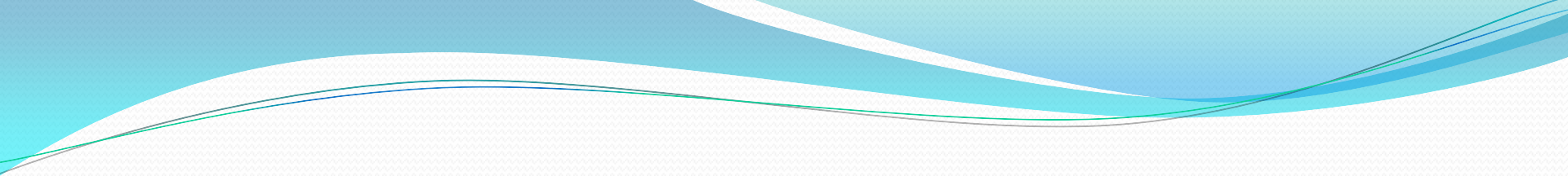-*Bacillus* spp., Pseudomonads, *Trichoderma* spp.

c. Chemical Control:

-Always use seed treated with fungicides effective against *R. solani*

and *Pythium* spp.

3. Fusarium Wilt (*Fusarium oxysporum* forma specialis *vasinfectum)*

-*Fusarium oxysporum* forma specialis *vasinfectum* (Fov) is a soil-inhabiting fungus that invades cotton plants via the roots and causes a blockage of the water conducting tissues resulting in wilting and eventual death of affected plants.

-This fungus produces two types of spores. Conidia for short term survival and dispersal and thick-walled chlamydospores that enable long -termsurvival.

External: Growth is stunted and leaves initially appear dull and wilted, before yellowing or browning progresses to eventual death from the top of the plant.
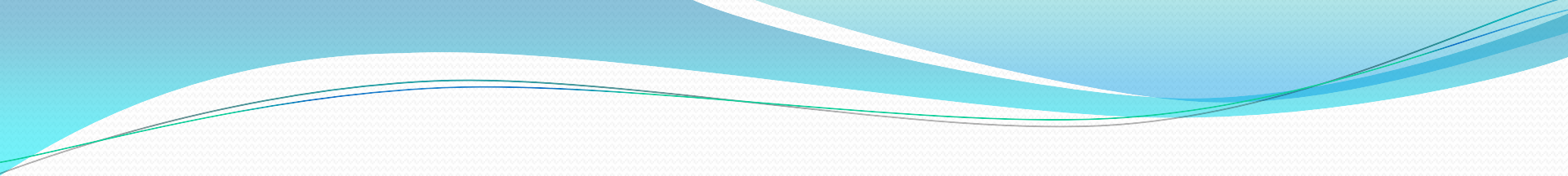-Some affected plants may re-shoot from the base of the stem.
-External symptoms can appear in the crop at any stage but most commonly become apparent in the seedling phase when the plants begin to develop true leaves and after flowering when the bolls are filling.

Classic *Fusarium oxysporum* forma specialis *vasinfectum* symtoms

Internal: Lengthwise cutting of the stem of an affected plant will reveal continuous brown discolouration of the stem running from the main root up into the stem.

✓The internal discolouration is similar to that of Verticillium wilt but usually appears as continuous browning rather than flecking in the stem tissue.
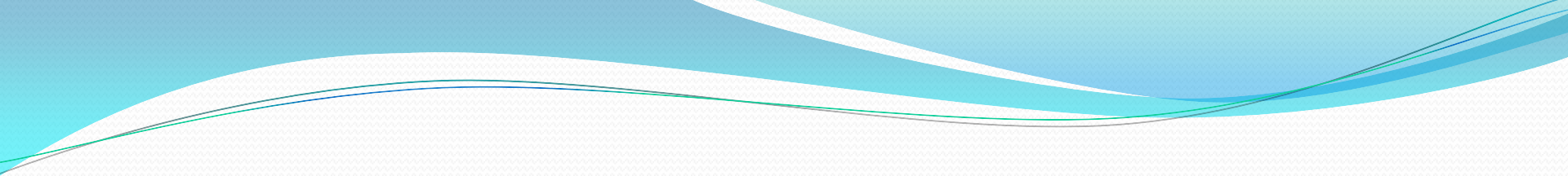
✓The severity of external symptoms does not always reflect the degree of internal discolouration that might be seen when the plant is cut open.

Stem vascullar *F. oxysporum* forma specialis *vasinfectum symptoms*

Control Measures:

-Use the most resistant cotton varieties available, especially if Fov occurs

in your district.

-Plant to avoid unnecessary stress to germination and early growth eg.

not in cold conditions.

 -Control weeds during and between crops.

-Avoid mechanical inter-row cultivations if possible during the crop (eg.

use shielded sprayer to control weeds).

-Manage the crop to avoid stresses such as waterlogging, over-

fertilisation, root damage.

-Solarisation may also be an appropriate treatment for small affected patches detected early in the season.

-Isolate affected areas from irrigation flows and traffic to avoid spreading the fungus. Minimise tail-water from affected fields.

-After harvest, retain crop residues on the surface for as long as possible before incorporation.

-Selection and management of rotation crops is important as the pathogen is able to survive in association with the residues of non host crops.

-Ensure that seed is treated (eg. Quintozene and Apron).

4. Cotton Bacterial Blight (*Xanthomonas axonopodis* pv. *malvacea)*

-The bacteria can attack hosts during all growth stages, infecting stems, leaves, bracts and bolls. Infected leaf has angular, dark-green watersoaked spots with red to brown margin that will eventually turn dark-brown or black due to death of the infected tissues.

-Severe infestation leads to premature falling of leaves.

-As the disease progresses, the leaf petiole and stem may become infected resulting in premature defoliation.

-An infected stem is girdle with black lesions causing it to die and break.

-An infected boll has round watersoaked spots causing it to rot.

-The bacterial blight is the most wide spread and destructive disease reported to cause yield losses of about 10 –30 per cent.

-Under favourable weather, bacterial ooze can be produced from the lesions on the lower leaf surface, on stems and on bolls.

Xanthomonas axonopodis pv. *malvacea* symptoms on cotton leaf and boll.

Control Measures:

-Crop rotation with crops that are not susceptible to the bacteria.

-Use of diseased-free seeds, diseased-free planting materials and cuttings, and use of resistant cultivars.

-Proper fertilization and water management.

-Proper land preparation for better drainage.

-Weed control .

-Removal and proper disposal of infected plant parts

-Deep plowing to bury plant debris and followed by fallowing the area.

5. Cotton Leaf Curl Virus

The disease causing virus belongs to **Gemini group.**

Transmission;

-The disease transmitted by feeding of the white fly, *Bemisia tabaci* with in 6.5 hours. A single female, carrying virus, can infest many plants.

-It may also be kept in mind that white fly is known to survive on as many as **53 host plant** species, and is responsible for transmitting **23 crop diseases** in region.
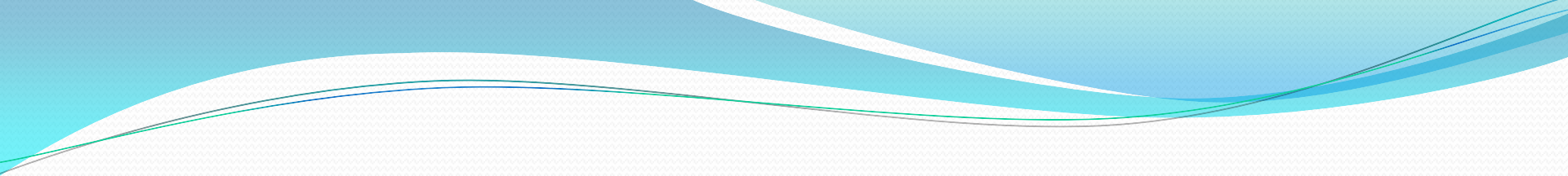
-At global level, white fly infests **600 different plant species**.

Symptoms

-Upward and downward curling of leaves accompanied by small as well as main vein thickenings on leaves, pronounced on underside.

-If a diseased leaf is viewed from beneath against the light, thickened vein found darker green and opaque than the normal.

-In extreme but not in frequent cases, formation of the cup shaped or leaf laminar (veins) out growth called "enation" appears on the back or underside of the leaf.

-The newly produced leaves are small, excessively crinkled and curled at the edge.

-The primary stem often tends to grow taller than normal.

-The enter-nodes being elongated and irregularly curved but sometimes the whole plant is stunted.

-The flowers checked in growth and become abortive.

-Bolls remained small in size and failed to open.

-All parts of badly hit plants are very brittle and ready broken.

Classic CLCV symptoms

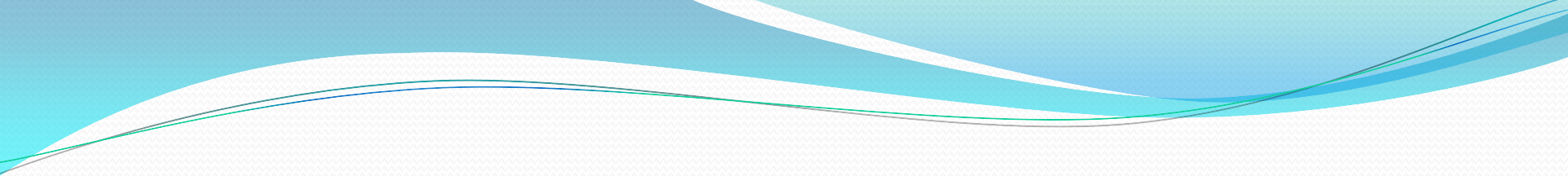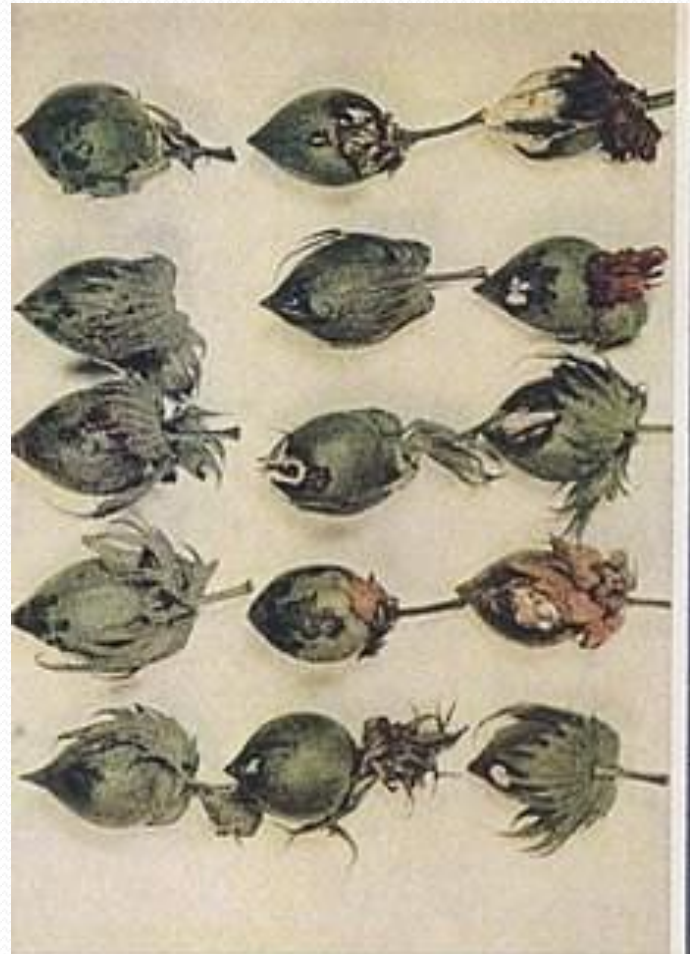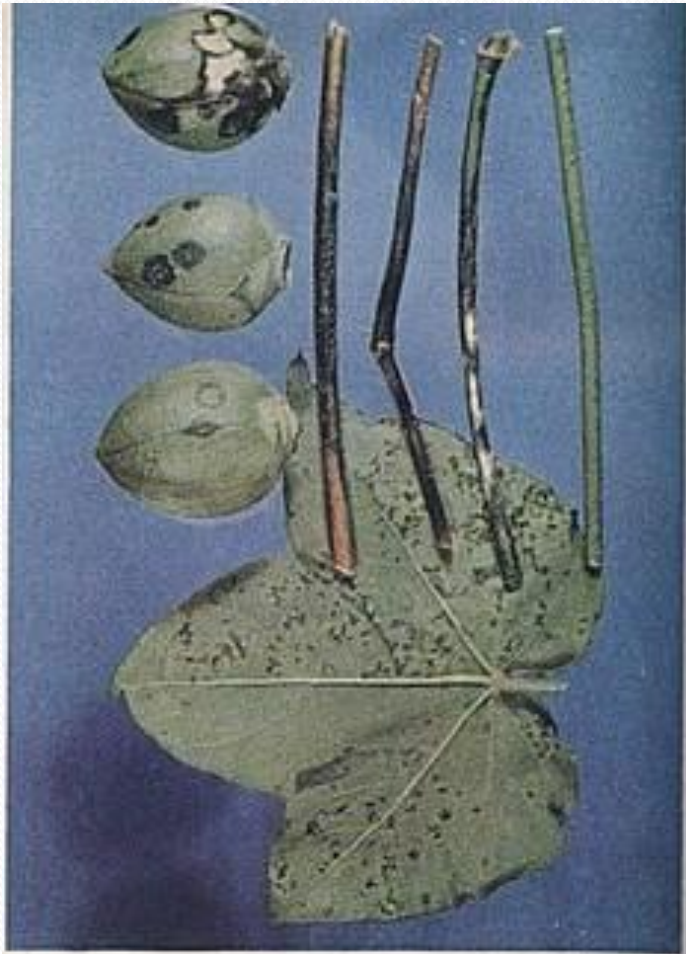
CLCV symptoms on cotton leaf

Control Measures:

-Use of resistant or tolerant cultivars

-Protect seedlings from whiteflies

-Use only good seeds and healty transplants

-Control whiteflies

-Immediately remove infected-looking plants and bury them

-Control weeds

-Don't plant cotton near tomato and /or other crops susceptible to whiteflies or vice versa

-Plow-under all plant debris after harvest or burn them when possible

-Practice crop rotation by planting crops that are not susceptible to whitefly

6. Cotton Anthracnose (*Glomerella gossypii* Edgerton)

-The only host is cotton. *Gossypium barbadense* and *G. hirsutum* cultivars are mostly susceptible, while *G. arboreum, G. herbaceum* and *G. thurberi* cultivars show some resistance.

-*G. gossypii* is transmitted through seed, and may also overwinter in infected cotton plant debris.

-Perithecia usually develop in old, dead tissues, and release ascospores which are the primary inoculum source.

-Usually, only the conidial spore stage is seen on the cotton plant.

-For symptoms to develop, an RH of about 100% and a temperature of 25°C are needed for 8-10 h.

-The disease caused by *G. gossypii* is most serious on seedlings and bolls, but lesions also occur on the stems and leaves of plants, sometimes producing a scald-like effect.

-Seedlings from infected seeds wilt and die. Infected bolls develop small, round, water-soaked spots which rapidly enlarge, become sunken and finally develop reddish borders with pink centres.

-In dry weather, diseased areas may be greyish in colour. Badly diseased bolls become mummified (darkened and hardened) and never open.

-In partially affected bolls, the fungus grows through and infects the seed.

-Lint from diseased bolls is frequently tinted pink and of inferior quality.

-Symptoms observed in the field include excessive branching, stem twisting, leaf curl, and necrotic lesions on leaves, bolls and stems.

G. gossypii symptoms on cotton leafs, stems and bolls

Control Measures:

-The disease is relatively easy to control by producing seeds

from healthy bolls

-Treating seeds with fungicides or acid treatment.

-Cultivars may show some resistance and this is being

actively sought against the more aggressive var.

cephalosporioides

THANK YOU

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