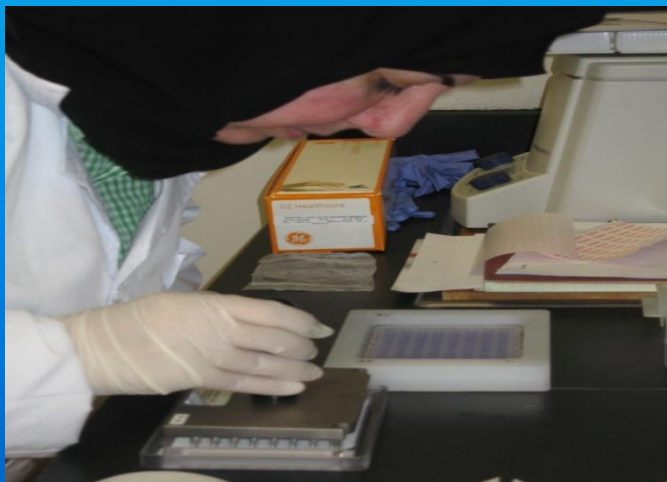




Application of Detection Technologies for Viral Diseases of Important Plant Crops in Kuwait

Presented by:
Ebtisam Al-Ali



Introduction

- Kuwait farms have suffered from heavy losses and dramatic reduction in Tomato crops due to TYLCV infection.
- Rapid spread of viral diseases due to long distance transportation and increase volume of free trade in plants has lead to sever losses.



- Most viruses are excluded from true seed during plant development. However, they are easily transported in planting material of vegetative crops, such as onion or in vegetable transplants. A recent example of this is the large losses in solanaceous vegetables caused by the recent spread of tomato yellow leaf curl virus (TYLCV) into the Middle East.



- The first step for successful management depend on proper identification of pests .However ,the confirmation is usually based on the virus identification using molecular detection methods.



Objective

- Equipping the existing laboratory to accomplish the work.
- Transferring technology for the diagnosis of major viruses infecting vegetable crops in Kuwait, using serological methods ELISA technique.
- Ten vegetable crops were selected from 4 families:
 1. Cucurbitaceae (cucumber, squash, melon, and zucchini).
 2. Solanaceae (tomato, potato, pepper and eggplant).
 3. Liliaceae (onion).
 4. Leguminosae (bean).



Methodology

Sampling:

Fresh plant leaf samples were collected from green houses and open fields (symptomatic and non symptomatic). Four samples from each farm were collected on monthly bases throughout the growing season (first month of planting, before flowering, flowering time, fruiting time). Six farms in two main production areas, south and north agricultural districts, were surveyed four times per year.



Kuwait Map showing two agricultural areas.

Al- Wafra 

Al-Abdalli 



Enzyme-linked immunosorbent assay (ELISA)

Double sandwich ELISA kits (DAS-ELISA) were purchased from BioReba and Agdia and assays were performed following the manufacturers' directions. Results were recorded after visual observation or spectrophotometrically by measuring absorbance at A_{405} nm.



The survey focused on: thirteen viruses for **Solanaceae** CMV, PVY, PVX, PVA, PVS, PVM, PLRV, PVV, PMTV, PMMoV, ToMV, TSWV, TYLCV.

CMV = Cucumber mosaic virus

PVY = Potato virus Y

PVX = Potato virus X

PVA = Potato virus A

PVS = Potato virus S

PVM = Potato virus M

PLRV = Potato leafroll virus

PVV = Potato virus V

PMTV = Potato mop-top virus

PMMoV = Pepper mild mottle virus

ToMV = Tomato mosaic virus

TSWV = Tomato spotted wilt virus

TYLCV = Tomato yellow leaf curl virus



Six Viruses for **Cucurbitaceae**: CMV, MNSV, PRSV, SqMV, ZYMV, and WMV).

CMV = Cucumber mosaic virus

MNSV = Melon necrotic spot virus

PRSV = Papaya ring spot virus

SqMV = Squash mosaic virus

ZyMV = Zucchini yellow mosaic virus

WMV = Watermelon mosaic virus

Three viruses for **Liliaceae**: OYDV, IYSV, and GarCLV

OYDV = Onion yellow dwarf virus

IYSV = Iris yellow spot virus

GarCLV = Garlic common latent virus

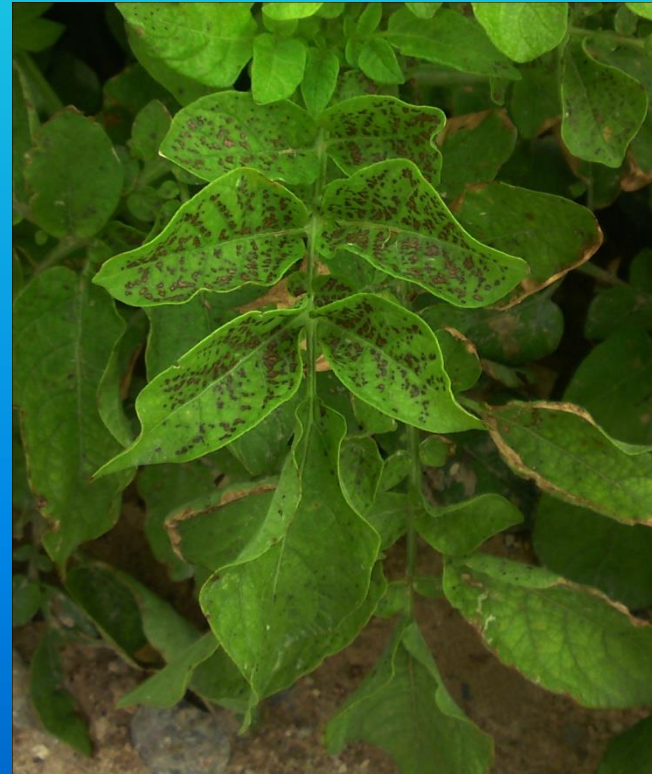
Two viruses for **Leguminosae**: TSWV and AMV viruses.

TSWV = Tomato spotted wilt virus

AMV = Alfalfa mosaic virus

Results

Symptoms on Solanaceous crops included mosaicking, mottling, malformation, yellowing, stunting, interveinal chlorosis, bronzing and silvering of the leaves, as well as fruit malformation and necrotic ringspot.



The symptoms on cucurbits included mosaicking, mottling, malformation, lesions, stunting, yellowing, and curling of leaves, as well as bumps or deformation of fruits.



Symptoms in Liliaceae (onion) plants consisted mainly of lesions, sometimes oval in shape on leaves. Most onion fields contained many weeds, which can act as a source of viruses. The incidence of severe symptoms was close to 100% in most fields. Symptoms in Leguminosae (bean) plants included yellowing.



Table 1. Survey of Viruses Affecting Cucurbit in Kuwait: Relative Frequencies of Samples Infection with CMV, MNSV, PRSV, SqMV, WMV, and/or ZYMV, as Determined by DAS-ELISA

•A total number of 90 samples were tested.

Crop	Viral Disease						No. of Infections per Sample			
	WMV	ZYMV	CMV	MNSV	PRSV	SqMV	Single	Double	Triple	> 3
Cucumber	88	20	8	90	8	5	1	63	16	10
Melon	90	90	0	90	7	3	0	0	81	9
Squash	86	88	11	89	3	0	0	6	71	13
Zucchini	84	90	6	90	41	0	0	4	45	41

Table 2. Survey of Viruses Affecting Tomatoes in Kuwait: Relative Frequencies of Infection with CMV, PVY, TYLCV, PepMV and/or ToMV, as determined by DAS-ELISA.

A total of 90 samples were tested.

Crop	Viral Disease					No. of Infection per Sample			
	CMV	PVY	TYLCV	PepMV	ToMV	Single	Double	Triple	4
Tomato	6	3	12	75	17	56	24	2	0

Table 3. Survey of Viruses Affecting Other Solanaceae (i.e., Potato, Pepper and Eggplant) in Kuwait: Relative Frequencies Infection with TSWV, ToMV, PMTV, PVX, PVA, PVS, PVV, PLRV, PVY, PMMoV and PVM, as Determined by DAS-ELISA

A total number of 90 samples were tested per crop.

Crop	Viral Disease										
	TSWV	ToMV	PMTV	PVX	PVA	PVS	PVV	PLRV	PVY	PMMoV	PVM
Potato	0	0	1	3	0	0	0	0	12	0	15
Pepper	0	1	0	0	0	0	0	0	2	1	0
Eggplant									0	0	0

Table 4. Survey of Viruses Affecting Liliaceae (i.e., Onion) in Kuwait: Relative Frequencies of Infection with IYSV, GarCLV and OYDV, as Determined by DAS-ELISA .

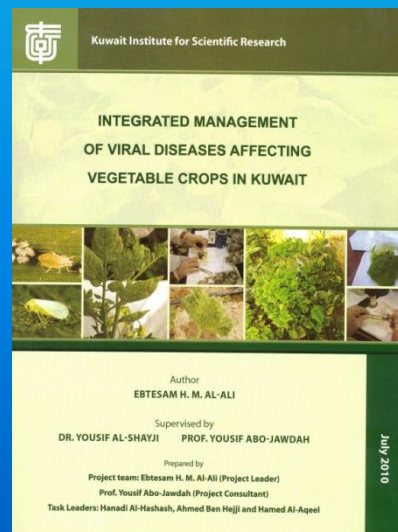
A total 90 samples were tested per crop.

Viral Disease				No. of Infections per Plant			
Crop	IYSV	GarCLV	OYDV	Single	Double	Triple	> 3
Onion	90	2	0	88	2	0	

Concerning bean (Leguminosae), most of the requested ELISA kits were not made available, therefore tests were conducted for only two viruses. AMV was detected in one sample.

Conclusion

This preliminary survey constitutes the first report in Kuwait of 15 of the 18 viruses detected, in Solanaceae, nine viruses were detected out of 14 tested, *Pepino mosaic virus* (PepMV) and *Tomato yellow leaf curl virus* (TYLCV) were the most predominant viruses. in Curbitaceae, all six viruses tested were detected mainly in double or triple infections. In onion, *Iris Yellow stunt Virus* (IYSV) was widespread; in bean, *Alfalfa mosaic virus* (AMV) was detected. A pamphlet entitled “Integrated Management of Viral Diseases Affecting Vegetable Crops in Kuwait” was issued and circulated to farmers.



Thank You

