THE NEED FOR FRUIT CROP SANITATION PROGRAMMES IN THE NEAR EAST REGION

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Abstract

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Fruit crops, such as citrus, stone fruits and grapes, are an important feature of the Near East region. They provide food for local consumption and in many cases are exported and constitute a major element of the local economy. The productivity of fruit crops in this region is falling behind that in developed countries. This is mainly attributed to the lack of sanitation programmes to improve the health status of these crops and to prevent the further spread of pests and diseases. Whilst the region harbours a limited group of such pests and diseases, others of a devastating nature, e.g. citrus greening, citrus canker, tristeza, plum pox (Sharka), etc., have not yet been introduced into the region or are of limited distribution. The sanitation situation of the fruit crops in the region is outlined and the need for crop sanitation is discussed. The methodologies for production, maintenance and distribution of healthy planting material are also described.

Additional key words: fruit crops, healty plants, pests, sanitation programmes.

The Near East Region* provides favourable environmental conditions for high level production and quality of Mediterranean fruit crops such as citrus, stone fruits and grapes. In fact, every country of the Near East region grows such fruit crops, which contribute to the food and refreshment of their people, and in many cases are exported, thereby constituting an important source of income. At present the region produces 10.8%, 10.6% and 11.3% of the total world production of citrus, stone fruits and grapes respectively (Table 1).

Table 1. Citrus, stone fruit and grape production in the Near East region[a].

Fruit crop	Production in the Near East[b]	World Production[b]	% produced in N.E.
Oranges	4480	41200	10.87
Tangarines, Mandarines Clementines, Satsuma	1097	7200	15.23
Lemons & Limes	486	5500	8.84
Grapefruit & Pomelo	268	4100	6.54
Citrus NES[c]	80	1100	7.27
TOTAL CITRUS	6411	59100	10.84
Almonds	214	1155	18.53
Apricots	586	1826	32.09
Plums	328	6000	5.47
Peaches & Nectarines	363	7590	4.78
Cherries	183	2200	8.32
Grapes	7400	65400	11.31

a - Data provided by FAO Statistics Unit as at December 1985.
b – In 100 metric tons.
c – Not Elsewhere Specified

Unfortunately, the present level of production per unit area in the region lags behind that in developed countries. Recent surveys (23) indicate that citrus production in the region ranges between 10 and 20 tons per hectare compared with an average of 50 tons per hectare in developed countries. Although data on the level of production of stone fruits and grapes in the region are not available, it is thought that productivity of such crops is similarly low.

This situation is attributed to various agronomic, cultural, pathological and entomological conditions. The health status of the planting material plays a major role in the present deterioration of productivity.

Health Status of Fruit crops in the Region

Most of the fruit crops grown in the Near East were introduced into the region a long time ago when there was not sufficient knowledge on their health status. Harmful insects, fungi, bacteria and nematodes associated with these crops were controlled by conventional means such as pesticides and cultural practices which proved effective in most cases. Virus and virus-like diseases are, unfortunately, unaffected by such control measures and their increase is continued by man when propagating with diseased scions and rootstocks, and when grafting existing trees with more desirable but diseased cultivars.

Recent surveys undertaken in the region by FAO con-

* Near East countries are: Afghanistan, Algeria, Bahrain, Cyprus, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, Turkey, United Arab Emirates, Yemen Arab Republic and Democratic People's Republic of Yemen.

sultants have shown that psorosis, cachexia-xyloporosis, stubborn, exocortis, impietratura, cristacortis, gummy bark of sweet orange, bud-union crease, tatter leaf and ring spot are wide-spread in citrus. Tristeza foci have also been reported in a number of countries, usually in foreign varieties, and apparently with limited or non-spreading characteristics (4,24). Citrus greening has recently been discovered in Saudi Arabia and North Yemen (5). Fanleaf, leafroll, stem pitting, corky bark, enation, fleck and vein necrosis are common diseases in all areas where grapes are grown (15). On stone fruits, prunus necrotic ring spot, prune dwarf, apple chlorotic leaf spot, raspberry ring spot and strawberry latent ring spot have been reported in many Near East countries and plum pox virus (Sharka) has been found in Turkey, Syria and Cyprus (9).

In general, health status surveys indicated that almost every fruit tree or vine in most countries of the region is infected with one or more virus or virus-like disease, which contribute to deterioration, poor productivity and low fruit quality.

Problems Induced by Virus and Virus-like Diseases of Fruit Crops

The effect of virus and virus-like diseases on fruit crops varies from almost nil to drastic reduction of yield; reduction of fruit size and quality (including fruit deformation); premature fruit drop; reduction of vigor and life-expectancy, induction of nutritional problems and increased susceptibility to other disorders. In addition to this, viruses and virus-like disorders are known to induce bud-union problems, to limit the use of desirable rootstocks, and to cause outright killing of trees and vines.

Methods of Control of Virus and Virus-like Diseases

Traditional procedures for protecting orchards from virus and virus-like diseases vary and include roguing infected trees, eliminating neighbouring alternate host plants, suppression of possible vectors and imposing quarantine measures. These methods are normally not very efficient. The most successful control measure which will ensure continuity, higher productivity and quality of fruit crops lies in the exclusion of virus and virus-like di - seases from new orchards. Exclusion is best accomplished by production, maintenance and distribution of healthy (virus-free) planting material under a supervised programme.

Fruit Crop Sanitation Programmes in the Region

At present there is only one programme for citrus sanitation operating in Morocco, which is still in the initial stages. A similar programme for stone fruits is being started in Turkey, and programmes for citrus, stone fruits and grapevine are underway in Cyprus. Apart from these, activities for production of healthy (virus-free) planting material seem not to have gone beyond the individual efforts of researchers or institutes in the form of importation of virus-free planting material for experimentation, observation or limited distribution purposes, or, in the case of citrus, for the production of nucellar lines. Testing for virus and virus-like diseases by indicator plants or serological methods is still in the early stages and is restricted to universities and/or research institutes. A similar situation exists for the implementation of procedures for the exclusion of virus and virus-like diseases from planting material.

Fruit Crop Sanitation Programmes in Developed Countries

Fruit crop sanitation programmes have been introduced during the last forty years and have provided the basis for a flourishing fruit industry in the developed world. They have led to the production and distribution of millions certified healthy plants throughout the world. Examples of such programmes are: the California Citrus Clonal Protection Programme (20), the USA IR - 2 Fruit Crop Clonal Selection Programme (11), California Clean Grape Stock Programme (13), the Citrus Variety Improvement Programme in Spain (17, 18) improvement of wine grape cultivar programmes in Italy (14) and the French programme for production of virus-free fruit crops (2). Schematic diagrams of some of these programmes are given in Figures 1, 2, 3.

Sanitation programmes depend basically upon the number and kind of diseases present in each country, their severity in terms of impact on viability and vigour, yield and quality as well as on the economic importance of the crop. The operation of successful sanitation programmes requires skilled, dedicated personnel; adequate facilities and financing; cooperation; suitable areas for growing and testing; nurseryman and grower interest; long term maintenance through periodic inspection and testing; and efficient government control.

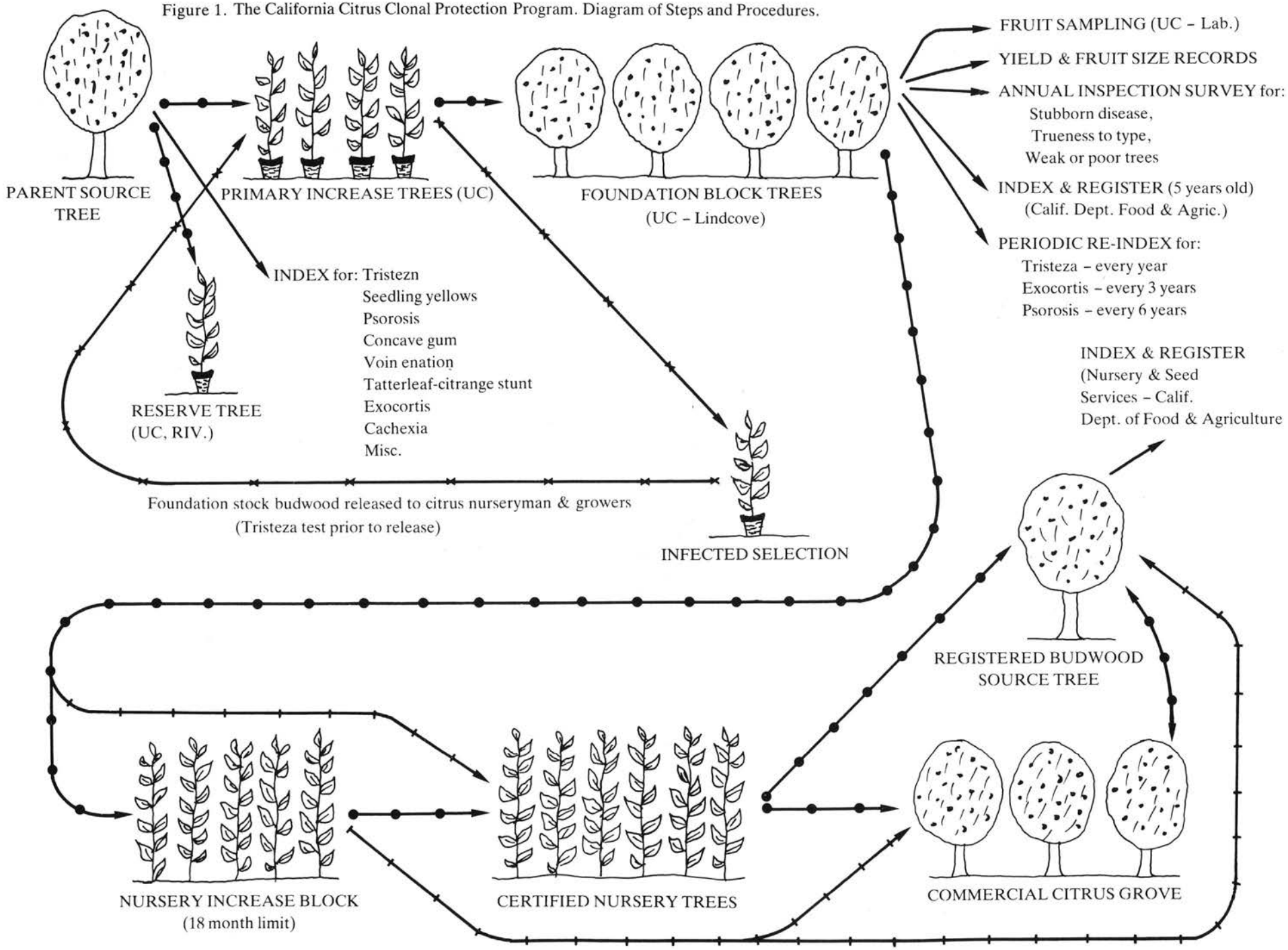
The Mechanism of Sanitation Programmes

Successful sanitation programmes are based on: disease recognition, methods for disease-detection, procedures for disease-exclusion, maintenance of foundation stock, and schemes for registration and certification of planting material.

Securing an acceptable level of freedom from virus in planting materials by visual inspection alone is not possible. Thus, healthy foundation stock will only be established when careful indexing proves freedom disease. Candidate material for indexing is obtained from apparently healthy orchard trees; from nucellar seedlings of citrus or their budline: and from material obtained after meristem culture, shoot-tip grafting or heat therapy. Trueness-to-type of the foundation stock material is essential. Once the foundation stock is available, it must remain disease-free while it produces budwood or cuttings for further increase. For this purpose it must be kept in isolated blocks where it is protected from possible vectors and inspected and re-indexed periodically.

The foundation stock provides planting material to establish registered «mother» plants. These, in turn, are

Figure 1. The California Citrus Clonal Protection Program. Diagram of Steps and Procedures.



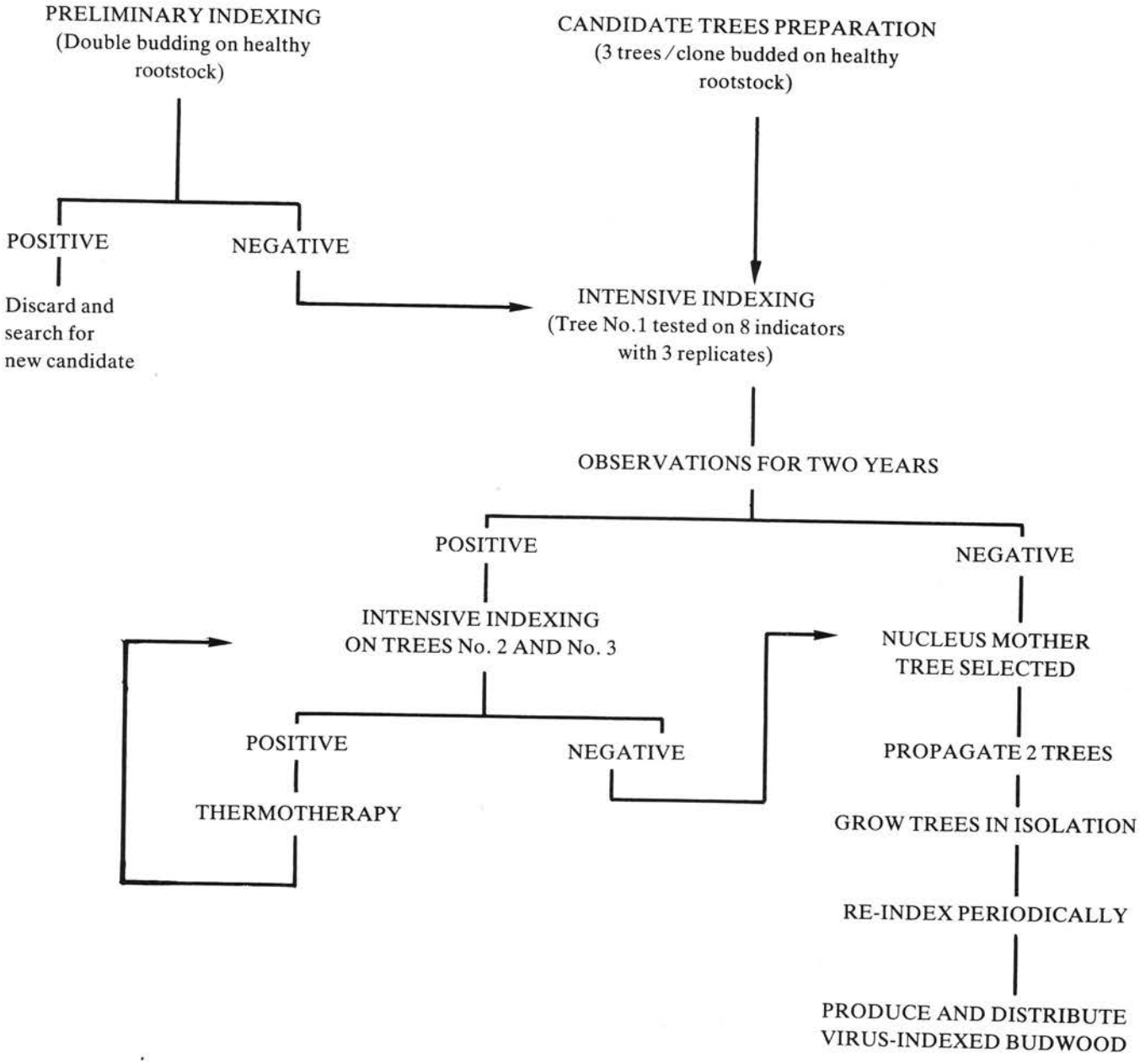


Figure 2. USA inter regional repository – 2 (IR2). Shematic diagram of *Prunus* clonal selection programme.

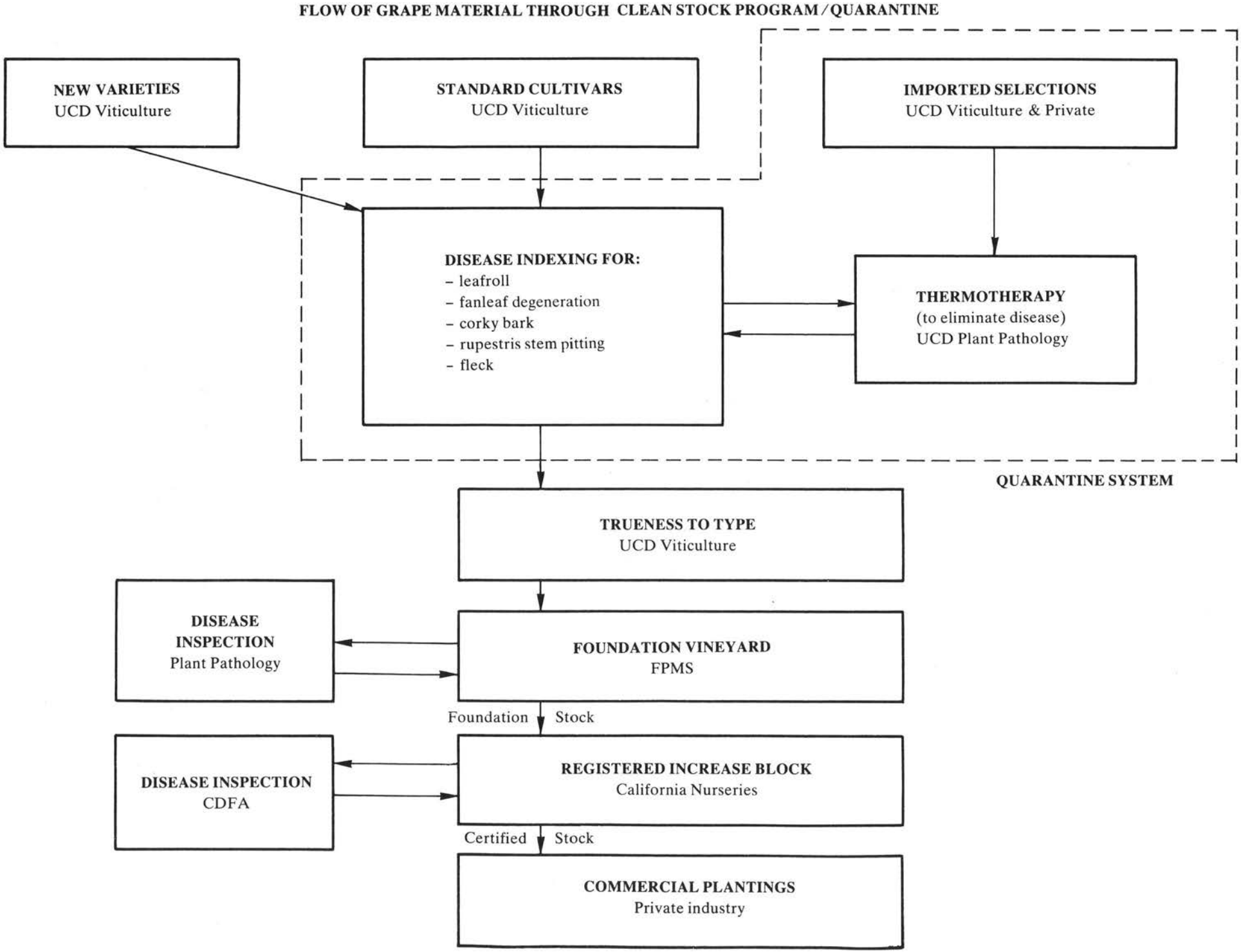


Figure 3. California clean grape stock programme.

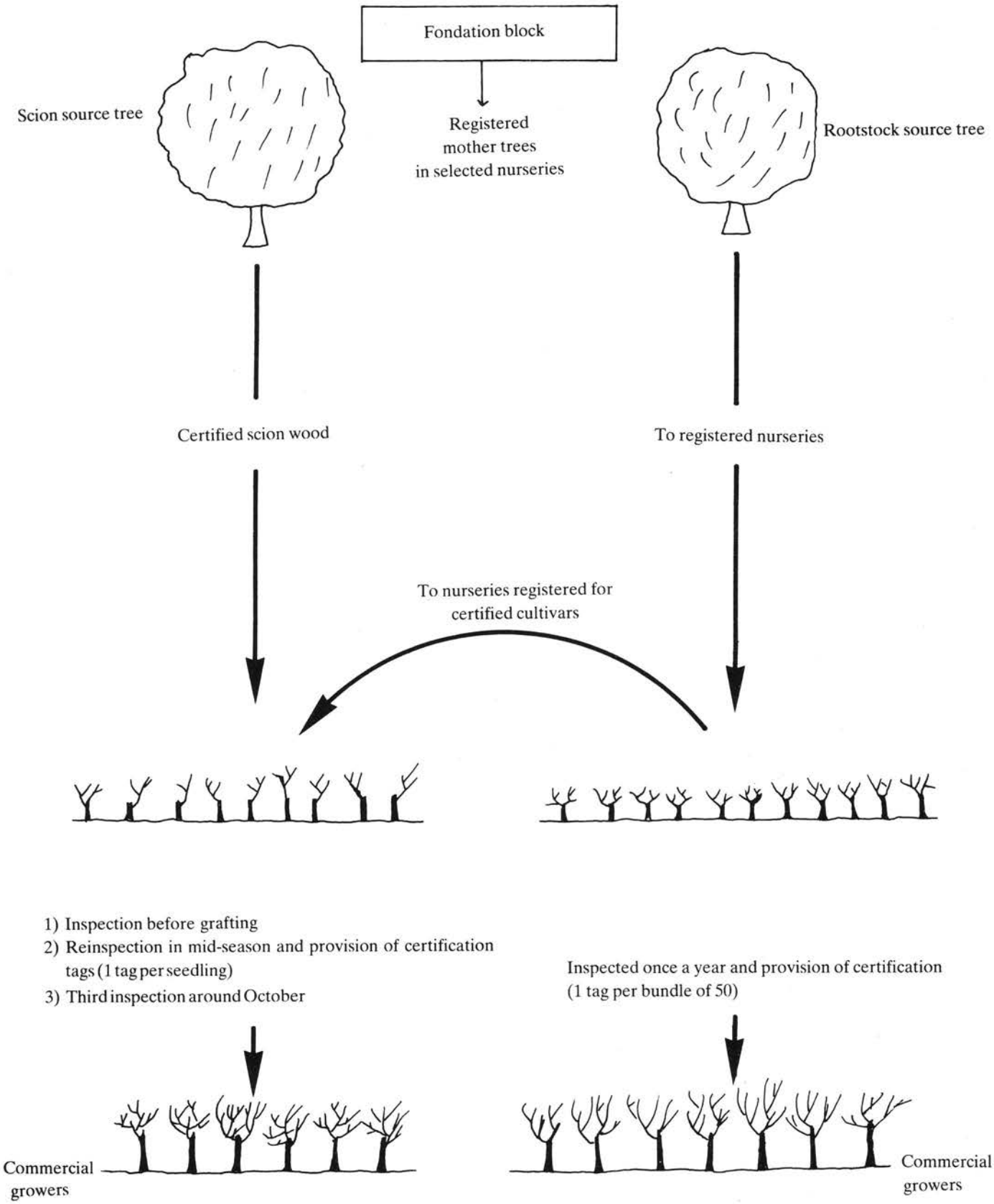


Figure 4. Registration and certification of healthy fruit tree planting material in France.

inspected and re-indexed on a routine basis to provide planting material to «increase» blocks in registered nurseries. These, in turn, provide growers with «certified» planting material under an inspection and certification scheme (Figure 4).

Disease Detection Methods

The essential disease detection method in fruit crop sanitation is indexing, whereby healthy and sensitive indicator plants are inoculated (usually by grafting) with buds or other material from a candidate selection and held in a proper environment (usually a conditioned green house and, in some cases, in the field) for a given period of time for symptom expression. If no symptoms occur during this period, the candidate selection is considered free of the disease for which it has been tested. Indicator plants are available for almost all known virus and virus-like diseases of citrus, stone fruits and grapes (Tables 2, 3, and 4). Although indexing is a time-consuming method, it is still the most precise means by which virus and virus-like diseases can be detected.

More rapid detection methods of certain virus and virus-like diseases are also available. They include serological methods, based on visible reaction of antigens and antibodies *in vitro*, e.g. ELISA (Enzyme-Linked Immunosorbent Assay) (25), electron microscopy; double-strand RNA (8); and, only for particular cases, e.g. stubborn disease of citrus, culturing (12). Although ELISA is very sensitive, results obtained by this method are sometimes variable and need to be confirmed by biological indexing.

Table 2. Suggested indicator plants for indexing the major citrus virus and virus-like organisms[a].

Pathogen	Indicator	Incubation period	Temp.°C	Symptoms
Cachexia-xyloporosis	Orlando tangelo Parson's Special Mandarin	1 – 2 years	26 – 35	Gum in the bark and pits in the wood.
Cristacortis	Orlando Tangelo Sour orange Sweet orange	10 months or more leaf symptoms sooner	moderate	Concave gum or psorosis-like leaf symptoms may appear, but are not diagnostic. Pitting and gumming of stems of Orlando and sour orange in later stages.
Exocortis	Etron citron (Arisona 861, USDCS 60 – 13, Kerkachi, etc.)	3 – 16 weeks	26 – 35	Leaf and stem epinasty, cracking of midvein, browning of underside of veins, stunting, blotching and cracking of stem, wrinkling and browning of petioles, browning of leaf tip.
Greening	Sweet orange Mandarin	4 – 12 weeks	African – type 18 – 24 Asian – type 21 – 35	Stunting, leaf blotching and chlorosis.
Impietratura	Grapefruit Sweet orange	One year or more	– –	Hard gummy deposits in rind and core of fruit. Psorosis-like leaf symptoms may occur, but not sufficient for diagnosis.
Psorosis	Sweet tangor Sweet orange seedlings (Madame Vinous or Do Ceu orange)	4 – 8 weeks	18 – 26	Clear flecks along veinlets, sometimes ring-like patterns on mature leaves, rapid die back of new growth (shock) usually followed by recovery.
Stubborn	Sweet orange, tangelo	4 – 12 weeks	26 – 34	Slow growth, leaf mottle, small leaves and short internodes.
Tristeza complex	Mexican lime for «stem pitting»	3 – 8 weeks	18 – 26	Veinlet clearing in young leaves; stem pitting.
	Sour orange, lemon or grapefruit for «seedling yellows»	4 – 8 weeks	18 – 26	Stunting and leaf yellowing of seedlings.
	Sweet orange on sour orange for typical Tristeza	3 – 24 months	18 – 26	Vein clearing, stunting and death of budded trees.
Vein Enation, woody gall	Mexican lime, *C.volk ameriane*, Rough lemon, sour orange and Rangpur lime	4 – 12 weeks for vein enations; often longer for woody galls	18 – 30	Enations on underside of veinlets. Mexican lime and sour orange; on trunks of *C. volkameriana*, lemon, Rangpur lime and Mexican lime.

a – Source anonymous

Table 3. Indicators and indexing techniques and respective virus diseases of stone fruits.

Technique	Method / indicator	N° of replicates	Temp. in °C	Duration D = days M = Months Y = years	Peach	Apricot	Plum	Almond	Cherry
Serological indexing	ELISA				Viruses of the Ilarvirus group Viruses of the Nepovirus group CLSV Plum pox (PPV)	Viruses of the Ilarvirus group Viruses of the Nepovirus group CLSV PPV	Viruses of the Ilarvirus group Viruses of the Nepovirus group CLSV PPV Tobacco mosaic Tobacco necrosis	Viruses of the: Ilarvirus group (incl. Apple mosaic virus) Viruses of the Nepovirus group CLSV, PPV Tobacco necrosis	Viruses of the Ilravirus group Viruses of the Nepovirus group CLSV Tobacco mosaic
Green house indexing	Herbaceous indicators								
	Cucumis sativus *Chenopodium quinoa*	5	20	20 D	Viruses of the Ilarvirus and Nepovirus groups, CLSV	Not reliable when apricot leaves are used as virus source	Viruses of the Ilarvirus and Nepovirus groups, CLSV	Viruses of the Ilarvirus and Nepovirus groups, CLSV	Viruses of the Ilarvirus Nepovirus groups, CLSV
	Woody indicators *Prunus persica* Seedlings GF 305 (or Elberta)	5	30	3 M	NRSV, PDV, CLSV, Plum Pox Yellow bud mosaic (Tom RSV), Stem pitting (Tom RSV, Willow Leaf, rosette Enation, Asteroid spot, Calico, Purple mosaic, Mottle, Yellow mottle, Blotch, Oil blotch, Mule's ear, Leaf roll, Seedling chlorosis, Star mosaic, Mosaic, Yellows, Rosette, Latent mosaic.	NRSV, PDV, CLSV, PPV, Mosaic, Ring pox, Pucker Leaf, Chlorotic Leaf mottle, Asteroid spot, Chlorotic Leaf roll	NRSV, PDV, Chlorotic necrotic ring spot, CLSV, Bark split (CLSV), Pseudopox (CLSV), European Line pattern, PPV, Stem pitting (Tom RSV), Myrobalan Latent ring spot, Rusty mottle, Mosaic, Chlorotic Leaf roll, American Line pattern.	NRSV, PDV, CLSV, Yellow bud mosaic (Tom RSV), Stem pitting (Tom RSV), Mosaic, Bud failure (Mule's ear), PPV.	Necrotic ring spot (NRSV) Prune dwarf (PDV), Chlorotic necrotic ring spot, CLSV, European rasp Leaf, American rasp Leaf, Eola rasp Leaf (= Stem pitting = Tom RSV) Strawberry Latent ring spot (SLRV), Mottle Leaf, Leaf roll
	Purnus tomentosa IR 473 / 1 or IR 474 / 1	3	22	3 M	NRSV, CLSV, PPV, Yellow bud mosaic (Tom RSV), Stem pitting (Tom RSV).	NRSV, PDV, CLSV, PPV, Ring pox (26°C).	NRSV, CLSV, Bark split (CLSV), Pseudopox (CLSV), Stem pitting (Tom RSV), PPV.	NRSV, Tom RSV, Stem pitting (Tom RSV), Yellow bud mosaic (Tom RSV, CLSV, PPV	NRSV, Eola rasp Leaf, (Tom RSV), CLSV.
	Prunus serrulata Shirofugen	5 buds	22 - 26	1 M	NRSV, PDV	NRSV, PDV	NRSV, PDV	NRSV, PDV	NRSV, PDV
	Prunus hybrid Shiro plum	3	18	6 W	Peach wart		Peach wart		Peach wart
	Prunus armeniaca Tilton	3	26	1 M		Ring pox			
Field indexing	*Prunus persica* Seedlings GF 305 (or Elberta)	3		4 Y	Same diseases as in the greenhouse and: Phony peach, X disease, Peach wart.				
	Prunus serrulata Shirofugen	5 buds		6 W-1 Y	NRSV, PDV	NRSV, PDV	NRSV, PDV, Chlorotic necrotic ring spot	NRSV, PDV	NRSV, PDV, Chlorotic necrotic ring spot
	Kwanzan	3		2 Y	Green ring mottle	Green ring mottle	Green ring mottle		Green ring mottle
	Prunus armeniaca Tilton	3		2 - 3Y	Apricot ring pox (probably Cherry twisted Leaf)	Ring pox.			
	Moorpark	3		3Y		Moorpark mottle, Chlorotic Leaf mottle, Stone pitting.			
	Luizet	3		3 Y		Chlorotic Leaf roll.			
	Prunus avium Sam	3		2 - 3 Y	Necrotic rusty mottle				European rusty mottle, American rusty mottle, Black canker Detrimental canker, Rusty Little cherry. European rasp Leaf, Hungarian rasp Leaf, American raspberry Leaf roll, European rusty mottle, Twisted Leaf, Short stem, Black canker, Deterimental canker, Mottle Leaf Rosette, Spur cherry.
	Bing grafted onto F12 / 1	3		3 Y					
	Prunus hybrid Shiro plum	3		2 Y			American Line pattern		

Table 4. Indicator plants for virus and virus- like diseases of grapevine[a].

	Diseases	Indicators
1.	Degenerative diseases of the fanleaf type, induced by European nepoviruses	*Vitis rupestris* St. George
2.	Decline diseases induced by American nepoviruses	
	- Tobacco ringspot and tomato ringspot viruses	Hybrids Seibel 13053 or 9549
	- Peach rosette mosaic viruses	*Vitis labrusca*
3.	Yellow mosaic induced by alfalfa mosaic virus	Hybrid Grezot 1x5C; *V. rupestris*
4.	Leafroll	LN 33 and Baco 22A
5.	Legno riccio - Rugose wood (Stem pitting, stem grooving) (c)	*V. rupestris; V. berlandierix V. riparia* Kober 5BB or 157/11; hybrid LN 33
6.	Corky bark	Hybrid LN 33
7.	Enation disease	*V. vinifera* cv. Italia, *V. berlandieri* x *V. riparia* Kober 5BB
8.	Fleck	*V. rupestris* St. George
9.	Asteroid mosaic	*V. rupestris* St. George
10.	Yellow speckle	*V. viniferac* v. Mission, Maltaro (= Esparte)
11.	Vein necrosis	*V. berlandieri*x *V. rupestris*|110R
12.	Vein mosaic	*Vitis riparia* Gloire de Montpellier

a - Source: Prof. G.P. Martelli, Istituto di Patologia Vegetale, Bari (Italy).

Other efficient serological techniques for detection of grapevine viruses whose agents have been identified are available.

Sanitation Methods

When no healthy planting material of a valuable variety or clone is available, sanitation is essential. This is undertaken by either one or a combination of the following methods:

Heat therapy. Buds or stem tips of infected material are subjected to prolonged, continuous exposure to high temperatures that leads to the destruction of the disease agent without affecting the planting material (21). A variety of simple thermotherapy chambers have been developed for this purpose (10).

Meristem or tip culture. Meristem tips of infected plants are cultured in nutrient media under aseptic conditions. This methods in most cases, permits bypassing the disease agent and produces healthy planting material (19).

Shoot-tip grafting (STG). This newly-developed technique is widely used in the elimination of various virus and virus-like diseases. The techniques is based on bypassing the disease agent by grafting the shoot-tip onto test-tube grown rootstock seedlings (16).

It has to be remembered that whatever the method used for sanitation, re-indexing is a necessity for confirming pathogen elimination.

Diseases Endangering Fruit Crops in the Region

Devastating diseases, which endanger fruit crop production in the Near East, fall into two categories: the first includes those diseases which are not yet present, such as citrus blight and Pierce's disease of grapes, and the second includes those diseases which have been introduced into certain parts of the region but are still of limited distribution. Whilst strict plant quarantine measures are needed to prevent the introduction or further spread of both, the second category should be considered as being of the most immediate importance. First, because the diseases **are** already in the region and, second , because their causal agents are vectored by insects or are easily transmissible by means other than grafting. Diseases belonging to this group are the following:

1) Citrus greening. This is the most devastating disease of citrus with the record of having wiped out the entire citriculture in many countries of South East Asia (6). The disease is caused by an intracellular bacterium vectored by citrus psyllids, *Diaphorina citri* and *Trioza erytreae,* which transmit the Asian and African form of the disease respectively. Greening and its vectors were introduced (in both forms) into the south western part of Saudi Arabia, but only the African form and its vector have been found in North Yemen (5). Citrus greening, if not contained or eradicated, constitutes a major threat to citriculture in the Near East region.

2) Tristeza has caused the destruction of millions of trees in various parts of the world (3,22). The extensive use of sour orange as a rootstock in the Near East Region, puts the whole citriculture in the area under a permanent threat of destruction because the virus causes bud-union incompatibility of varieties grafted on this rootstock. Foci of the virus have been found in various countries of the region, but the absence of the efficient aphid vector *(Toxoptera citricida)* and of more destructive strains, which could be vectored by the common and widespread aphid *(Aphis gossypii)*, may well explain the localized distribution pattern of the disease and the absence of serious epidemics.

3) Citrus canker is considered to be another threat to citriculture. The disease, which is caused by the bacterium *Xanthomonas campestris* pv. *citri*, is very destructive to foliage, twigs and fruits. It is spread by infected plant material, man, wind, insects and farming tools. Campaigns to eradicate the disease, although very expensive, have proved successful (7). The disease was recently introduced into Saudi Arabia, North Yemen, Oman and the United Arab Emirates. At present a campaign of eradication is underway in North Yemen.

4) Plum pox (Sharka). This is a serious disease of stone fruits, in particular plums, apricots, peaches and nectarines. It is transmitted by aphids and by infected budwood. Plum pox causes premature fall of fruits and fruit deformation. Symptoms on fruit reduce their quality and render them unmarketable (1). The disease occurs in Turkey and Syria, and was recently introduced into Cyprus.

FAO Contribution to Fruit Crop Improvement in the Near East

The need for crop sanitation programmes in the Near East has been recognized by FAO and various initiatives have been undertaken to promote and protect fruit crop production in the region. Among these was the organization of a Workshop on Production, Maintenance and Distribution of Healthy (virus-free) Nuclear Stocks of Mediterranean Fruit Crops, which was held in Valenzano (Italy) in October 1983. This workshop led to the setting up of the Mediterranean Fruit Crop Improvement Council, which now has more than 100 participants from various parts of the region. The aims of this informal group, which is serviced by the FAO Plant Protection Officer for the Near East, are the promotion of fruit crop production in the region and the exchange of information among its members. A newsletter is issued at regular intervals to provide information on relevant fruit crop improvement activities. FAO is also assisting in national surveys on virus and virus-like diseases of citrus, stone fruits and grapes and is aiding countries of the region in establishing their national fruit crop improvement programmes. So far, 19 surveys have been carried out. Recognizing that the success of any programme depends mainly on the availability of well-trained personnel, FAO, in collaboration with the International Centre for Advanced Mediterranean Agronomic Studies (ICAMAS), has established an International Centre for training on production and protection of Mediterranean fruit crops in Valenzano (Italy). The centre, which started its activities in 1985, provides a nine months course orientated towards fruit crop improvement. The centre will also house a repository of healthy planting material of Mediteranian fruit crop varieties and rootstocks. FAO is also supporting research in developed countries with the aim of introducing efficient detection and control methods for diseases endangering fruit crops in the region. Recently, the health status situation of fruit crops was reviewed by an FAO Expert Consultation held in Rome in September 1985 and attended by national and international experts, who made a number of recommendations for fruit crop improvement. Assistance is also provided by FAO to interested governments under its Technical Cooperation Programme (TCP).

Conclusion

The health status of fruit crops in the Near East region is quite critical. Numerous intracellular pathogens are debilitating citrus, stone fruit and grapevine pathogens in various countries as a result of propagation of infected planting material. New devastating diseases have found their way into some parts of the region and now threaten their fruit crops. At present the region produces over 10% of the total world production of fruits and, indeed, this could be notably increased through sanitation programmes. Such programmes have already contributed to the establishment of rewarding fruit crop industries in the developed world. The bases for such programmes are disease detection and exclusion, maintenance of nuclear stock and well-organized schemes for registration and certification of planting material. Although the necessary techniques and schemes for implementation are already available, insufficient attention has been given so far to their utilization in the region. Political, financial and technical support for the implementation of such programmes are needed to permit the establishment of what could be a leading fruit industry in the world.

الملخص

طاهر، محمود. 1986 . ضرورة القيام ببرامج لتحسين الوضع الصحي للأشجار المثمرة في بلدان البحر الأبيض المتوسط والشرق الأدنى . مجلة وقاية النبات العربية 4 : 52 - 62

ان الأشجار المثمرة كالحمضيات واللوزيات والكرمة هي من العناصر المهمة في زراعة منطقة البحر الأبيض المتوسط والشرق الأدنى . هذه المحاصيل هي جزء من غذاء السكان في كل بلد على حدة وفي كثير من الأحيان تصدر إلى بلدان أخرى وتكون بذلك عنصراً مهماً في دعم الاقتصاد. ان معدل الانتاج في هذه المنطقة هوضعيف فيما إذا قورن بانتاج البلدان النامية. ان أحد اسباب قلة الانتاج المهمة هو عدم وجود برامج لانتاج أشجار سليمة خالية من الأمراض الفيروسية وشبه الفروسية. ولو أنه يوجد في المنطقة عدد قليل من هذه الأمراض، إلا أن الأمراض التي تسبب كوارث مثل اخضرار الحمضيات، تقرح الحمضيات البكتيري، التدهور السريع للحمضيات، جدري الخوخ (الشاركا) . . . الخ لم تدخل إلى هذه المناطق أو في بعض الحالات أدخلت ولكن بشكل محدود. في هذه الدراسة سأتعرض للوضع الصحي للأشجار المثمرة في المنطقة وسأناقش ضرورة إيجاد برامج لتحسين الوضع الصحي لهذه الأشجار. وكذلك سأتعرض للطرق المستعملة في انتاج والمحافظة وتوزيع الأغراس الخالية من الأمراض.

كلمات مفتاحية: الأشجار المثمرة، آفات، برامج إنتاج شتول سليمة، برامج تحسين الوضع الصحي.

References

1. Anonymous. 1985. **Plum pox virus.** Data sheets on Quarantine Organisms. EPPO Bull. No, 130 Set 6, p.7.
2. Anonymous. 1985. Production and certification of healthy virus-tested fruit tree planting material in France. Mediterranean Fruit crop Improvement News 3:12 - 13.

المراجع

3. Bar-Joseph, M., C.N. Roistacher, S.M. Garnsey and D.J. Gumpf. 1981. A review on Tristeza, an ongoing threat to citriculture. pp. 419 - 423 in **Proc. Int. Soc. Citriculture.** Tokyo, Japan.

4. Bove, J.M. 1986. **Stubborn and natural transmission of *Spiroplasma citri* in the Medittanean area and the Near East.** FAO Plant Protection Bull. No. 34 (in press).

5. Bove, J.M. 1986. **Greening in the Arabian Peninsula and towards new techniques for its detection and control.** FAO Plant Protection Bull. No. 34 (in press).

6. Broadbent, P. 1983. **Citrus greening and virus diseases in China and South East Asia.** Technical Document No. 132 (pp. 21), Asia and Pacific Plant Protection Commission, FAO Regional Office for Asia and the Pacific, Bankgok, Thailand.

7. Civerolo, E.L. 1984. Bacterial canker diseases of citrus. Journal Rio Grande Valley Horticultural Soc. 37:127 - 146.

8. Dodds, J.A., R.L. Jordan, J.A. Heick and S.J. Tomaki. 1984. Doublestrand RNA for the diagnosis of citrus and avocado viruses. pp. 330 - 336 in **Proc. 9th IOCV.** Riverside, U.S.A.

9. Dunez, J. 1986. **Preliminary observation on the presence of virus and virus-like diseases of stone fruit trees in the Mediterran and the Near East countries.** FAO Plant Protection Bull. No. 34 (in press).

10. Fridlund, P.R. 1962. An inexpensive heat chamber for curing virus diseases plants. Plant Disease Reporter 46:703 - 705.

11. Fridlund,P.R. 1980. The I - 2 Programme for obtaining virus-free fruit trees. Plant Disease 64: 826 - 830.

12. Fudl-Allah, A.E.S.A., E.C. Calavan and E.C.K. Igwegbe. 1972. Culture of a mycoplasma-like organism associated with stubborn disease of citrus. Phytopathology 62:729 - 731.

13. Goheen, A.C. 1980. The California clean grape stock programme. California Agriculture 34: 15 - 16.

14. Martelli, G.P. 1979. Identification of grapevine and production of disease-free plants. Vitis 18: 127 - 136.

15. Martelli, G.P. 1986. **Virus and virus-like diseases of the grapevine in the Mediterranean area.** FAO Plant Protection Bull. No. 34 (in press).

16. Navarro, L. 1981. Citrus shoot-tip grafting *in vitro* (STG) and its applications: a review. pp 452 - 465 in **Proc. Int. Soc. Citriculture.** Tokyo, Japan

17. Navarro, L., J.F. Ballester, J. Juarez, J. Pina, J.M. Arregui and R. Bono. 1981. Developments of a programme for disease-free citrus budwood in Spain. pp. 70 - - 73 in **Proc. Int. Soc. Citriculture.** Tokyo, Japan.

18. Navaro, L.J., J. Juarez and J.F. Ballester. 1984. The citrus quarantine station in Spain. pp. 365 - 370 in **Proceedings 9th IOCV.** Riverside, USA.

19. Quak, F. 1977. Meristem culture and virus-free plants, pp. 598 - 646 in **Applied and fundamental aspects of plant cell, tissue and organ culture.** J. Reinert and Y.P.S. Bajaj (Editors). Springer-Berlag, Berlin.

20. Reuther, W. 1981. The Citrus Clonal Protection Programme. California Agriculture, Jan-Feb 1981.

21. Roistacher, G.N. 1977. Elimination of citrus pathogens in propagative budwood. I. Budwood selection, indexing and thermotherapy. pp. 956 - 972 in **Proc. Int. Soc. Citriculture**. Tokyo, Japan.

22. Roistacher, C.N. and M. Bar-Joseph. 1984. Tristeza and related diseases. pp. 9 - 18 in **Proceedings 9th IOVC.** Riverside, U.S.A.

23. Salibe, A.A. 1984/85. Survey of virus and virus-like diseases of citrus in Egypt, Morocco and Tunisia. Unpublished reports. FAO, Rome.

24. Salibe, A.A. 1986. **Incidence of virus and virus-like diseases in the citrus orchards of some Mediterranean and adjacent countries.** FAO Plant protection Bull. No. 34 (in press).

25. Voller, A., A. Bartelett, D.E. Bidwell, M.F. Clark and A.N. Adams. 1976. The detection of viruses by enzyme-linked immunosorbent assay (ELISA). J. Gen. Virol. 33: 165 - 167.