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# Citrus industry and certification programmes in Lebanon

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**SUMMARY** - Scientific institutions of Lebanon are in great difficulty because of the lack of funds and of the heavy damage suffered during the civil war. However research activity in fruit crops is being resumed thanks also to foreign support (including that provided by MAI-B and the University of Bari). By visual inspection the following diseases have been detected in citrus: blind pockets, concave gum, impietratura, psorosis A, cachexia, stubborn. Tristeza has not been reported, but a specific survey has not been carried out. Now a programme in collaboration with MAI-B and the University of Bari has been set up for the establishment of a certification programme for citrus, grapevine and stone fruits.

**Key words**: citrus, virus, viruses-like, certification, project, Lebanon

***RESUME*** *- Les Institutions scientifiques libanaises se trouvent confrontées à de grandes difficultés vu la pénurie de fonds et les graves dégâts provoqués par la guerre civile. Toutefois, l'activité de recherche est aujourd'hui en plein essor aussi grâce à l'appui étranger (y compris le soutien assuré par l'IAM-B et l'Université de Bari). En effectuant des inspections visuelles, il a été possible de détecter les maladies suivantes: blind pocket, concavité gommeuse, impietratura, psorose A, cachexie, stubborn. La tristeza n'a pas été rapportée, mais des prospections ciblées n'ont jamais été réalisées. A l'heure actuelle, un programme en collaboration avec l'IAM-B et l'Université de Bari a été lancé pour la mise au point d'un programme de certification des agrumes, de la vigne et des essences à noyau.*

***Mots-clés***: *agrumes, virus,virus-similaires, certification, projet, Liban*

## Citrus industry

a. Lebanese climate

Lebanon, located to the eastern side of the Mediterranean Basin, is characterized by an extremely variable range of microclimates mostly due to the presence of two mountain chains, the Mount Lebanon and the Anti Lebanon, running more or less parallel to each other and to the sea. Between the two chains lies the fertile Bequaa plain, representing the most important agricultural production area in the country. The Anti Lebanon chain is to the eastern side of the country and is partly within the Syrian borders. The Mount Lebanon chain runs parallel to the coast leaving a narrow strip of fertile

plains along the length of the country with the widest area in the Akkar plains to the North, forming the second most important agricultural plain in Lebanon. The Mount Lebanon chain rises towards the North at an altitude of up to 3050 m and intercepts most of the water-saturated clouds coming from the sea, creating a coastal zone characterized by mild winters with high rainfall and hot summers with high humidity. Along this narrow coastal zone, several subtropical crops are grown, mostly citrus, and to a lesser extent banana, loquats, cherimoya, avocado and others (Figure I).

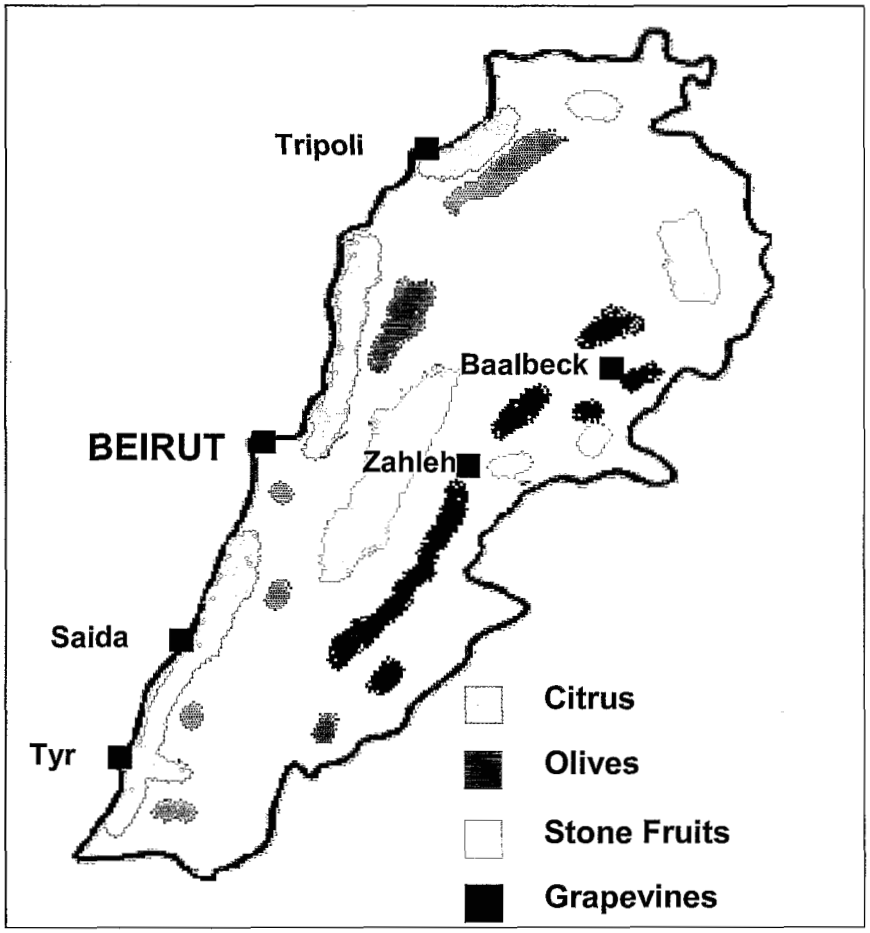


***Figure I*** - Fruit cropping areas in Lebanon

b. Citrus production and its constraints

Citrus production is very important in Lebanon and is spread all along the coastal zone. The majority of the citrus orchards are located in the South of the country, mostly south of the city of Saida with another important concentration of orchards in the Akkar plains (figure I). The total citrus production area increased from 5,000 to 12,000 ha between 1950 and 1970, with an average yield of 30 T/ha. However, this area dropped to an estimated 9,000 ha in 1993. In spite of this decline, citrus is still one

of the most important fruits produced in Lebanon. The major reason for the reduction in the citrus production is mostly the declining profitability which results from:

1) High production costs: this is specially due to the deflation of the Lebanese pound during the years of civil crisis and to the increase in the labour costs and the prices of the agricultural inputs (fertilizers and pesticides) which were paid by the Lebanese grower in hard currencies and at international prices.

2) Declining exports: this a very serious problem since the export of citrus fruits specially to the Arab countries was a major source of income to the Lebanese economy. The exports, once over 150,000 tons ranking Lebanon tenth among the citrus exporters of the world, were estimated to be only 66,863 tons in 1992. The absence of agricultural exports organization and of the quality standards control jeopardized the stability and reduced the credibility of the Lebanese citrus export market. Besides, the developments achieved in export markets, variety and quality improvement of citrus products in the neighbouring countries in the absence of any such developments in Lebanon during the years of civil troubles, isolated the country from its traditional export markets which have not yet been replaced.

3) Declining yields: this is mostly due to the neglect of growers to their citrus orchards throughout the years of the civil conflict. This was reflected by the lack of introductions of new varieties, the absence of proper cultural, disease and pest management practices, specially with the deficiency in the extension service. The situation was further aggravated by the security problems in the South of Lebanon, the most important citrus growing area of the country, due to the still lasting state of war.

4) High postharvest losses: this is mostly due to the absence of proper storage, transport, packaging and processing facilities. The establishment of such facilities requires high investments which were neither feasible nor economical in Lebanon during the several years of civil conflict due to the absence of a reliable and organized local and export market, a stable monetary value of the Lebanese Pound and the absence of the basic infrastructure such as running water and a continuous supply of electricity.

## Citrus varieties

Before the sixties citrus orchards in Lebanon were mostly orchards with mixed plantations, specially with banana, and trees were planted at a distance of 3-6 meters. The varieties were almost exclusively the local ones such as the orange varieties Baladi (Bizri), Khetmali and Shamouti (Yafawi), the latter being the most important orange variety (65% of all orange trees in Lebanon). It was only in the sixties and seventies that new varieties were introduced which quickly replaced the older ones with the exception of Shamouti. These included varieties such as Washington Navel and Valencia, and later the Moro blood orange, the Washington Sanguine (Doublefine ameliorée). Other varieties which were

also grown in Lebanon were the Mawardi orange (scented), Succari Moghrabi (very sweet), Succari Shamouti (sweet). The lemon varieties grown were mostly the cv. Saasli followed by cvs. Eureka and the Malti. In the late sixties and because of their partial resistance to the very common mal secco disease, Interdonato and Monachello lemons were introduced. Other citrus varieties grown in Lebanon during that period were Mediterranean Willowleaf mandarin, Clementine mandarin, Wilking mandarin, Ortanique tangor, White Marsh grapefruit, Red Blush grapefruit, Reinking pummelo, sour orange and sweet lime.

Nowadays, varieties such as Bizri, Khetmali, sweet lime and Wilking mandarin are almost extinct. The most common orange varieties are the Washington Navel followed by Valencia and Shamouti, with the trend towards an increase in the Valencia production area. The lemon acreage has tremendously declined mostly due to mal secco, but cv. Saasli is still holding importance in spite of its susceptibility to the disease because of its productivity and its inclination to summer flowering for the production of "verdelli". Clementine mandarin has become the most important mandarin. Grapefruit production area has decreased but only slightly and new pigmented varieties with better market potentials have been newly introduced. Pummelo production area has apparently slightly increased probably due to the Chandler (red) pummelo introduced in the eighties.

The most common rootstock used in Lebanon has always been and still is the sour orange (>95%). Other rootstocks used are the Volkameriana and the Trifoliate hybrids. The ealier commonly used Palestine Sweet lime has become almost extinct mostly due to its susceptibility to the citrus gummosis disease.

## Citrus nurseries

In earlier times, the Lebanese Agriculture Research Institute was able to provide clean propagating material to the local nurseries which was then sold to the farmers. The citrus nursery business, accordingly, flourished. With the years, however, citrus growers lost their confidence in the nurseries due to the cessation of the research institute to provide clean buds and the mistrust in the variety trueness of the material sold. Now, most growers have started to grow their own seedlings, in spite of the presence, especially in the South of the country, of several very small unspecialized nurseries. Several growers, on the other hand, have started importing certified plants of old and new varieties from known nurseries in Europe and the USA. High costs, however, still limit the extent of such importations. The Lebanese fruit grower, specially the small one, is often unaware of developments and requirements of the local and foreign markets, changes in international prices and the new developments in variety improvements worldwide.

In Lebanon, there are still no proper regulations organizing the nursery business in any fashion. Any grower, technician or businessman can have his own nursery and sell material without any quarantine or quality control or certificate of variety trueness.

## Sanitary status of citrus orchards

The sanitary status of citrus in Lebanon is not properly known. No recent survey has been made since the seventies but there are several unofficial or unpublished reports which indicate the presence of serious sanitary problems. Virus and virus-like diseases are expected to be relatively widespread from the symptoms often recorded in a large number of orchards and due to the complete absence of quarantine control and proper sanitary checks of the nurseries and their propagative material.

Two important surveys were conducted and results published on diseases of crops in Lebanon by Saad and Nienhaus (1969) and Sardy, Davet and Khatib (1970). The reports of Ghazali (1962) from the Agricultural Research Institute (ARI) are also an important source of information on viral diseases of citrus in the country. However, by the time Lebanon started having well equipped diagnostic laboratories for proper viral identification, the civil war had started and most of the research and surveys were stopped.

The major fungal diseases identified and reported to affect the citrus industry in Lebanon are the mal secco (*Deuterophoma tracheiphila*) which is very widespread and severe on lemons and to a lesser extent on oranges, the citrus gummosis disease (*Phytophthora citrophthora* and *P. parasitica*) which is not so widespread but causes very severe trunk rot, and branch and trunk rotting due to *Botryodiplodia theobromae,* which is widespread and severe on both lemons and oranges. Other diseases reported include root rots (*Fusarium spp., Rosellinia sp.*), leaf spots (*Phyllosticta sp., Phoma sp.*), fruit spots and rots (*Alternaria sp., Penicillium spp., Phoma sp.*), and twig die back (*Colletotrichum sp.*). Of the bacterial diseases attacking citrus, the citrus blast (*Pseudomonas syringae*) was reported in Lebanon on lemon and sweet lime as being of minor importance.

The virus and virus-like diseases reported to affect citrus in Lebanon are mostly identified by symptomatology and include blind pocket, concave gum, impietratura, psorosis A, Rio Grande gummosis, xyloporosis, and stubborn. Tristeza could not be observed until the early eighties, during which the virology laboratory of the American University of Beirut was checking whenever possible, and by ELISA technique, samples from citrus orchards in the South of Lebanon. No realistic picture of the situation of virus and virus-like diseases of citrus in Lebanon could be obtained before a proper and thorough survey is conducted and the appropriate diagnostic tests performed. Such a survey is being planned for 1995/1996 by the Plant pathology laboratories of the Lebanese University and the American University of Beirut.

## Certification programs for the sanitary improvement of citrus

The Lebanese government, the research and educational institutions, the farmers as well as the private agricultural business sector are now becoming aware of the importance of the presence of quarantine and a serious certification program in Lebanon, not only for the citrus industry, but for all other vegetatively propagated plant material grown in Lebanon. This awareness could have been achieved

several years earlier, if it had not been for the 17 years of civil conflict in the country. Even now the priority of the government is set elsewhere on the quick improvement of the economic situation of the country through the reconstruction of destroyed infrastructures, in providing basic services to people, and in the rehabilitation of the administrative structure of the public sector. Still however, there is a clear understanding of the Ministry of Agriculture and the public and private agricultural sector of the importance and the urgent need for a certification program in Lebanon for the improvement of the agricultural sector.

The general response was hence very positive and cooperative when the idea for the establishment of a certification program was initiated in 1994 through a cooperative project of the Faculty of Agricultural Sciences of the Lebanese University (FAS/LU), the Mediterranean Agronomic Institute (IAM-B), and the University of Bari, Italy. The project is the first attempt in Lebanon to locally produce, conserve and utilize certified propagative material that is virus-free or virus-tested and true to type. The project, which will start with the development of certified local grape and stone fruit varieties, will later be expanded to other fruit tree crops and vegetables once the system is working.

The project involves different stages including:

- the determination of the sanitary status of the fruit trees in Lebanon;
- the establishment of the proper legislation for the certification program to be adopted by the Lebanese government. This sets the regulations, the institutions involved in the program, the methodology and type of control undertaken on the certified material at the repository, the mother blocks and the public or private nurseries;
- the establishment of the infrastructures needed to implement this certification program (diagnostic laboratory, screenhouses, glasshouses, mother block fields, etc.);
- the training of the scientific and technical human resources in Lebanon to be able to fulfil their jobs within this program.
- So far the project has been developed as follows:
- a survey has been conducted on the grapevine and stone fruit sanitary situation in Lebanon during 1994/1995 by students undertaking their Master degree at the IAM-B and in cooperation with scientists from the University of Bari and the FAS/LU. The results will be finalized by the end of 1995.
- the plant pathology laboratory at the FAS/LU is being further equipped to serve also as a virology diagnostic laboratory and it will be completely working by the summer 1995.
- the certification legislation to be presented to the Lebanese government has been developed by the cooperative work of scientists from the IAM-B, the University of Bari and the FAS/LU. It is in the process of being legally reviewed by the Ministry of Agriculture in Lebanon. The legislation is expected to be adopted by the Lebanese parliament by the end of 1995.

- funds have been allocated by the Lebanese Agriculture Research Institute (ARI) to build a screenhouse and repair a glasshouse at their Tel Amara research station in the Bequaa valley.
- a field has been identified and reserved for ARI - Tel Amara Research Station to be used as a mother block for the production of certified plant material.
- several of the agricultural University graduates who have received their specialized training in plant virology (Master level or PhD level) at either the University of Bari or the IAM-B, Italy, will be given the opportunity to join the Lebanese institutions involved in this certification program (FAS/LU and ARI) upon their return to their home country.
- the Lebanese agricultural private and public sector including several influential nurserymen and farmers have been contacted and informed of the project.
- workshops and seminars are being planned for the coming years to improve the awareness of the farmers and specially the nurserymen on the importance of the utilization of certified plant material.

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