

INTENSIVE PROGRAMME 2007/08: EURHORTICOLA: NEW APPROACHES ON HORTICULTURAL TRAINING IN THE EUROPEAN COMMUNITY

Development of Medicinal and Aromatic Plants [MAP]

*Fernanda Delgado de Sousa**



INTRODUCTION

Since the end of the 20th century, the European markets and particularly the one of the North of Europe have a growing demand of medicinal and aromatic plants (MAP). The consumers' interest for polifontional species has been a reality in growth. A same species or genera of this group of plants can possess a series of uses: to feed, perfume, ornamental, cosmetics and pharmaceutical.

The growing search of products of natural origin as alternative to the use of synthesis products easy to obtain but with a semi craft labour, it has constituted a hard incentive for the development of larger produced volumes and marketed of aromatic and medicinal plants as well as a demand in new ways vegetables of bioactive products. These last ones they are used so much in the domain of the health as in other sectors where are used that respect the ambient like phytopharmaceutical products.

There are literally hundreds of medicinal and aromatic plants used in European herbal industry. The French pharmacopoeia, for example, lists 421 plants that it considers as valued sources of herbal medicine. As a consequence, the safety and quality of herbal medicines have become increasingly important concerns for health authorities and public alike.

One in each five patients consume medicinal plants, 60-70% of the patients don't reveal to the doctor / pharmacist because: consider natural product as innocuous and have fear.

The figure 1 shows the increasing in the world market of products to the base of Plants.

The largest market is Europe, being responsible for 38% of the world market.

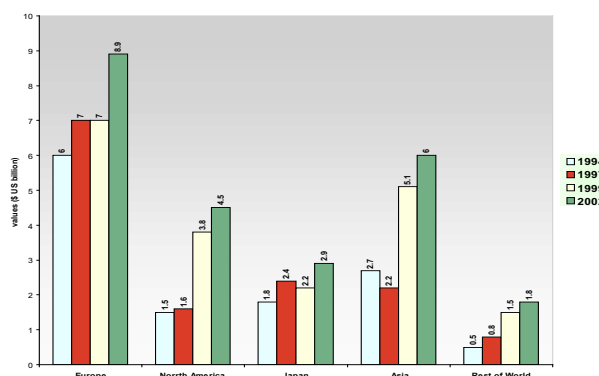


Figure 1 - World market of products to the base of Plants

The European country with the largest consumption slice is Germany, being responsible for 50% of the European

market, following for France, England and Italy.

The trade is above all driven through Germany, where they are most of the great companies importers.

In Europe more than 2000 species are used with commercial ends; The species more cultivated are: lavender, pity-opium and fennel. The larger cultivations in CE: are in France, Hungary, Germany and Spain. In no CE countries the greater cultivations are in Bulgaria and Albania.

European German companies, dominate the global medicinal and aromatic plant sector. There are about 20 major wholesalers of MAPs and seven agents. There is an increasing interest in organic certified MAPs and about half of the importers and wholesalers also deal in organic plant material *although the quantities are small compared to conventional products. Only very few importers and processors deal only in organic MAPs and spices

1. DEFINITION OF MEDICINAL AND AROMATIC PLANTS (MAP)

The origin and the use of the medicinal and aromatic plants are older than the agriculture, once the vegetable medicine is as primitive as the man. The biblical references about aromatic plants and medicine ayurvedic are numerous and contemplate the fiction of oriental cultures about perfumes, medicinal applications, culinary utilization and the unguent to embalm.

In first place we are going to define medicinal, aromatic and culinary plants, because this terms are such used indiscriminately.

Medicinal Plants are the lot of vegetable plants that elaborate in one or in several organs secondary metabolites or beginnings actives capable to alter the physiologic functions of the animal organisms (ex: chamomile; lime; ginseng; vervein and angelica root)

Aromatic Plants is a sub group of the medicinal plants, whose actives are constituted total or partially for essential oils of volatile nature (ex: rose; geranium; lavender and jasmine).

Spicy or culinary plants is a sub group of the aromatic plants, used by the conservators and organoléptics properties that check to the foods and drinks.

In this group we also have the spices and the herbs.

Herbs are •herbaceous plants, leaves, flowers and stems. We use them in green and in dry or the essential oil. They are from temperate areas, and they have lowers% of essential oils (parsley; coriander; mint; oregano and basil)

Spices are vegetable products, peels of trees, rhizomes, flowers, fruits, or seeds. They are used in dry and are from tropical and sub-tropical areas. They have discharges% of essential oils (ex. cloves; paprika; ginger; pepper, cinnamon and vanilla)

We also have some other group of plants that we use as pesticides, repellent, colouring and stimulating plants.

2. ENVIRONMENTAL AND SOCIAL ASSESSMENT

In the world the MAP repartition depends on ecological factors, like climate, and soils. Some species are calcicoles or calcifuges and others can stand different kind of pH in the soil. The climate is a factor of vital importance, principally for the temperature, humidity and light.

The Mediterranean countries are rich in different landscapes and ecosystems and have a high biodiversity. The collection of wild medicinal and aromatic plants has been important for centuries.

The MAP sector is dominated, on the production side, by traditional wild collection, including more than 100,000 families as groups in rural areas.

The safety and quality of raw medicinal plant material and finished products depend on factors that may be classified as intrinsic (genetic) or extrinsic (environment, collection methods, cultivation, harvest, post-harvest processing, transport and storage practices). Inadvertent contamination by microbial or chemical agents during any of the production stages can also lead to deterioration in safety and quality. Medicinal plants collected from the wild population may be contaminated or have intentional adulteration, all of which may have unsafe consequences. As a matter of fact, very heterogeneous raw material will be found on the market never meeting the quality requirements. Furthermore, trained collectors are rare and, for this reason, the identity of the plant material cannot always be guaranteed.

The collection of medicinal plants from wild population can give rise additional concerns related to global, regional and/or local over-harvesting, and protection of endangered species. Safety and quality assurance measures are needed to overcome these problems and to ensure a steady, affordable and sustainable supply of medicinal plant materials of good quality. In recent years, good agricultural practices have been recognized as an important tool for ensuring the safety and quality of a variety of food commodities, and many Member states have established national good agricultural practice guidelines for a range of foods. However, quality control for the cultivation and collection of medicinal plants as the raw material for herbal medicines may be more demanding than that for food production, possibly for this reason, only China, the European Union, and Japan have recently developed guidelines on good agricultural practices for medicinal plants.

3. SPECIFIC PROBLEMS ON THE CULTIVATION

MAPs has a particular context because the most of the species of this group of plants doesn't have good agricultural practices, so the estimation of the real production in the different countries it's difficult.

Due to the recent political and economical development of Eastern European countries it is not to be expected that domestication of wild MAP has any priority there. This should be a challenge for Mediterranean countries. The list of candidate plants to be domesticated has increased. Species like *Achillea millefolium*; *Arnica montana*; *Artemisia annua*; *Chelidonium majus*; *Echinacea sp.*; *Genciana lutea* and *Valeriana edulis* among others, are examples of medicinal plants domesticated within the last decades.

In Portugal which are the species to explore?

Limonete (*Aloysia triphylla*); Mint-pepper (*Mentha piperita*); Herb-prince (*Cymbopogon citratus*); Balm-mint (*Melissa officinalis*); Thyme-lemon (*Thymus x citriodorus*); Laurel (*Laurus nobilis*); Equinácea (*Echinacea sp.*).

The market presents however flotation in the search of some of these species, that are arrested above all with the world offer in certain moment.

The farmer should be prepared to face those flotation, tends enough elasticity to bet in a new species, more lucrative, in a short space of time.

4. GOOD AGRICULTURAL PRACTICES FOR MAPS

4.1. IDENTIFICATION/AUTENTICATION OF CULTIVATED MAPS

4.1.1. SELECTION OF MEDICINAL PLANTS

The species or botanical variety for cultivation should be the same as the specified in the national pharmacopoeia or recommended by other authoritative national documents to the end-user's country.

4.1.2. BOTANICAL IDENTITY

The botanical identity- scientific name of each medicinal plant under cultivation should be recorded.

4.2. SEEDS AND OTHER PROPAGATION MATERIAL

Seeds and other propagation materials should be speci-

fied. This material used for organic production should be certified as being organically derived.

4.3. CULTIVATION

Cultivation of MAP requires intensive care and management. The conditions and duration of cultivation required vary depending on the quality of medicinal, aromatic or spice materials required. Since this is not an agricultural manual. Emphasis are placed on methods of growing that, without use of substances which damage the environment, will provide a reasonable supply of natural products for household, and medicinal uses.

Conservation Agriculture (CA) techniques should be followed where appropriate, especially in the build-up of organic matter and conservation of soil humidity.

4.3.1. SITE SELECTION

Medicinal plant materials derived from the same species can show significant differences in quality when cultivated at different sites, owing to the influence of soil, climate and other factors. These differences may related to physical appearance or to variations in their constituents, the biosynthesis of which may be affected by extrinsic environmental conditions, including ecological and geographical variables, and should be taken into consideration.

Risk of contamination as a result of pollution of the soil, air or water by hazardous chemicals should be avoided. The impact of past land uses on the cultivation site, including the planting of previous crops and any applications of plant protection products should be evaluated.

4.3.2. ECOLOGICAL ENVIRONMENT AND SOCIAL IMPACT

The cultivation of MAP may affect the ecological balance and, in particular, the genetic diversity of the flora and fauna in surrounding habitats. The quality and the growth of medicinal plants can also be affected by other plants, other living organisms and by human activities. The introduction of non-indigenous medicinal plant species into cultivation may have a detrimental impact on the biological and ecological balance of the region.

The social impact of cultivation on local communities should be examined to ensure that negative impacts on local livelihood are avoided. In terms of local income-earning opportunities, small-scale cultivation is often preferable to large-scale production, in particular if small-scale farmers are organized to market their products jointly.

4.3.3. CLIMATE

Climate conditions, for example, length of day, rainfall and field temperature, significantly influence the physical, chemical and biology qualities of MAP.

4.3.4. SOIL

The soil should contain appropriate amounts of nutrients, organic matter and other elements to ensure optimal growth and quality. The use of fertilizers is often indispensable in order to obtain large yields of MAP. Animal manure should be thoroughly composted to meet safe sanitary standards of acceptable microbial limits and destroyed by the germination capacity of weeds. Growers should implement practices that contribute to soil conservation and minimize erosion, for example, through the creation of streamside buffer zones and the planting of cover crops and “green manure” such as alfalfa.

4.3.5. IRRIGATION AND DRAINAGE

Irrigation and drainage should be controlled and carried out in accordance with the needs of the individual medicinal plant species during its various stages of growth.

4.3.6. PLANT MAINTENANCE AND PROTECTION

The timely application of measures such as topping, bud nipping, pruning and shading may be used to control the growth and the development of the plant, thereby improving the quality and quantity of the medicinal being produced.

Any agrochemicals used to promote the growth of or to protect MAP should be kept to a minimum, and applied only when alternative measures are available. Integrated pest management should be followed.

5. HARVEST

MAPs should be harvested during optimal season or time period to ensure the production of the material and the finished herbal products of the best possible quality. The time of harvest depends on the plant part used. It is well known that the concentration of biologically active constituents varies with the stage of the plant growth and development.

During harvest, care should be taken to ensure that no foreign matter, weeds or toxic plants are mixed with the harvest plant material.

MAPs should be harvested under the best possible conditions, avoiding dew, rain or exceptionally high humidity. If harvesting occurs in wet conditions, the harvested mate-

rial should be transported immediately to an indoor drying facility to expedite drying so as to prevent any possible deleterious effects due to increased moisture levels, which promote microbial fermentation and mould.

Cutting devices, harvesters, and other machines should be kept clean and adjusted to reduce damage and contamination from soil and other materials.

All containers used at harvest should be kept clean and free of contamination by previously harvested medicinal plants and other foreign matter. If plastic containers are used, particular attention should be paid to any possible retention of moisture that could lead to the growth of mould.

6. PERSONNEL

Growers and producers should have adequate knowledge of the medicinal plant concerned. This should include botanical identification, cultivation characteristics and environmental requirements (soil type, soil pH, fertility, plant spacing and light requirements), as well as the means of harvest and storage.

7. POST-HARVESTING PROCESSING

Harvested or collected raw plant materials should be promptly unloaded and unpacked upon arrival at the processing facility. Prior to processing, the medicinal plant materials should be protected from the rain, moisture and any other conditions that might cause deterioration. Medicinal plant materials should be exposed to direct sunlight only where there is a specific need for this mode of drying.

Medicinal or herb materials that are to be used in the fresh state should be harvested/ collected and delivered as quickly as possible to the processing facility in order to prevent microbial fermentation and thermal degradation. The materials may be stored under refrigeration, in jars, in sandboxes, or using enzymatic and other appropriate conservation measures immediately following harvest/ collection and during transit to the end-user.

8. BULK PACKAGING, STORAGE AND LABELLING

Processed MAP materials should be packaged as quickly as possible to prevent deterioration. Continuous in-process quality control measures should be implemented to eliminate substandard materials, contaminants and foreign matter prior to and during the final stage of packaging. In figure 2 we can see a great store of a producer.



Figure 2 – Storage in a great store

Reusable packaging material such as jute sacks and mesh bags should be well cleaned (disinfected) and thoroughly dried prior to reuse. All packaging materials should be stored in a clean and dry place that is free from pests and inaccessible to livestock, domestic animals and other sources of contamination. A label affixed to the packaging should clearly indicate the scientific name, the plant part, the place of origin, the cultivation or collection date and the name of the grower/collector and the processor and quantitative information.

Whenever required and when is possible, fresh MAP materials should be stored at appropriate low temperatures, ideally at 2-8°C; frozen products should be stored at less than -20°C.

9. THREATENED AND ENDANGERED SPECIES

MAPs that are protected by national and international laws, such as those in national “red” lists, may be collected only by relevant permission according to national and/or international laws. The provisions of the Convention on International trade in Endangered Species of Wild Fauna and Flora (CITES) must be complied with.

When medicinal plant materials from threatened, endangered or protected medicinal plant species are obtained through cultivation, they should be accompanied by appropriate documentation in accordance with national and/or regional regulation.

10. RESEARCH NEEDS

Research is greatly needed to improve the agronomy of cultivated MAPs, promote the exchange of information on agricultural production and investigate the so-

cial and environmental impact of MAP cultivation and collection.

CONCLUSION

The very strong expansion of the MAP sector is, above all, based on changes in life-style in the industrial countries. The perfumery and the cosmetics industries have responded to the success of health products, whereas flavour have become essential to more sophisticated food products.

They are multiple the references of use of the aromatic ones in gastronomy, medicine and cosmetics

The intensity of its flavour, the wealth in vitamins, antioxidants and minerals makes these plants contribute for a healthier life.

Intense flavour allows to reduce the amount of other harmful seasonings to the health *ex:SALT.

Relationships between synthetic and natural materials are the key point for the future trends in the market of essential oils, depending on scientific and technological progress.

Up to 1930 natural products dominated the scene, and the expertise at Grasse was decisive in determining approaches to production, extraction and blending. Developments in synthesis were relatively slow: the first step was to isolate natural molecules (cinnamaldehyde for cinnamon and benzaldehyde from bitter almonds). The first synthetic flavour appeared in 1850 (amyl acetate) and 1876 (vanillin). The modern perfumery uses sophisticated synthetic molecules and numerous molecules protected by patent have taken place of traditional oils. They are still used in the most famous perfumes formulated decades ago, but they are progressively abandoned in the new formula.

The market and the industrial use of aromatic plants is very contrasted, with short circuit of commercialization and products which have undergone minimum transformation.

Each market sector will have particular consequences on the production sector. In order to be competitive, a producer must make a precise identification of the market requirements, the strategies of the international traders, the price determination and the production capacities of the existing producers.

It is important to determine the most profitable market sector, and to determine the key factor in competitive production for each of these market branches.

For the aromatic plant market, we can distinguish in particular:

- spices and aromatic plants in their traditional dry form;
- dehydrated herbs;
- fresh herbs;
- frozen herbs;
- essential oils, aroma and natural isolates.
- For the medicinal plant market:
 - traditional phytotherapy;
- new phytopharmaceuticals;
- herbal extracts;
- plants uses in pharmaceutical industry.
- For the perfumery plant market:
 - alcoholic perfumery;
 - detergents and air fresheners;
 - cosmetic and other uses.

Summarizing there is an enormous potential on plant genetic resources to be used- supposed the items quality-safety- efficacy are respected.

From the socioeconomic point of view we are in a new situation, but nevertheless transitional phase: first time in human history we have since a very short period- no more than one generation –in Western Europe and North America a surplus of food crops and arable land. Searching

for alternatives to keep agriculture running and intact special attention is paid, therefore, to "renewable sources" one sector of which being secondary plant products.

As long as there are still funds for research in surplus crops there must be also sufficient pool for developing medicinal and aromatic plant production. The Mediterranean region has all necessary prerequisites for this development: manpower, experience in large and small scale production of some of these special crops, facilities for breeding and seed production, and at last, a favorable climate with enough solar energy also for coming technologies in post harvest handling and transformation.

BIBLIOGRAPHY

Franz, Ch (1994) Significant medicinal and aromatic plants to be cultivated in the Mediterranean region. Proceedings of international meeting "Cultivation and improvement of medicinal and aromatic plants" Trento.

Simonetti, G (1990) Encyclopedia of herbs and spices. Macdonald.Milan

WHO (2003) Guidelines on good agricultural and collection practices (GACP) for medicinal plants. World Health Organization. Geneva,

* Instituto Politécnico de Castelo Branco - Escola Superior Agrária. Portugal

