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Commission "Directives de PI et Agrément"

GUIDELINES FOR INTEGRATED PRODUCTION OF GRAPES

IOBC Technical Guideline III

3rd Edition, 2007

Edited by C.Malavolta & E.F. Boller

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The content of the contributions is in the responsibility of the authors

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Preface of 3rd edition

The necessity of a revision of the grape guidelines (2nd edition, 1999) was discussed at the WG “Integrated Protection in Viticulture” meeting in Volos (2003) and was decided at the meeting 2005 in Boario Terme. Ernst Boller volunteered to make the necessary adaptations to the new IOBC Standard 2004 for IP and to produce a draft document in 2006. Most of the agronomic content of the 2nd edition remains unchanged as that version 1999 has already achieved a good level of quality. Added as yellow marked texts are changes and adaptations to titles and numbers of individual chapters, and of texts to fit the basic IP document published in 2004 (3rd version).

Many additions – especially in the pesticide handling part - incorporate the propositions made by Thierry Coulon (ITV France) in 2003 and components of Good Agricultural Practice contained in important international food safety standards (such as EUREP-GAP). Although we refer often to the full details published in the basic document of 2004 we repeat many aspects in the grape guideline in order to make our IOBC guidelines and IOBC inspection systems compatible with major international food standards.

The document has been examined by the IP Commission on November 2006 and forwarded to the Convenor of the WG “Integrated Protection in Viticulture”, Prof. Carlo Lozzia for consultation among experts of this Working Group.

Having received some observations and comments from members a new version was discussed in a specific expert panel during the Marsala WG Meeting held on 25th October 2007.

We would like to extend our thanks to all persons that assisted in the preparation of this document by their direct input and advice.

The final text of the 3rd edition was read and approved by the Commission on April 2008.

Carlo Malavolta
Co-Editor
Member of Commission

Ernst F. Boller
Co-Editor
Member of Commission

Preface of 2nd edition

Why a second edition of the technical guideline III for Integrated Production in Viticulture published in 1996?

At the occasion of the 8th General Assembly 1997 IOBC Council reviewed the activities and progress of its Commissions and Working Groups.

With respect to the Commission "IP-guidelines and Endorsement" Council did not only take note of the successful progress of the endorsement procedure for regional IP-organisations but also requested that all IOBC guidelines for Integrated Production have to meet a uniform quality standard set by the 2nd edition of the IOBC guidelines on pome fruit published in 1994. That particular document does indeed provide orientation marks and can be considered a useful model not only with respect to the formal structuration of a crop specific guideline but also with respect to the standards of minimal requirements to be reached by national or regional IP-organisations seeking IOBC endorsement. It is evident that official IOBC guidelines for Integrated Production not only had to provide the necessary crop specific basis for the IOBC endorsement procedure but follow a general concept set by IOBC.

Council and Commission realised that this objective was difficult to achieve without precise guidance given to the various working groups and expert panels preparing crop specific guidelines under the IOBC umbrella. The Council decided therefore to give its IOBC Commission "IP-Guidelines and Endorsement" the mandate to co-ordinate and supervise the preparation of future guidelines and to define the procedures to be followed during guideline preparation. The Commission was also asked to initiate without delay an adaptation of the technical guideline for Integrated Production in viticulture published in 1996 that showed certain shortcomings concerning formal structuration and degree of specification.

The Commission has decided to use an expert system that has given high satisfaction already at earlier occasions. It consists of the establishment of a first draft of a guideline by a group of experts, making best use of all available information. This draft is then distributed for consultation among a wider range of experts active in IP-organisations, scientific institutions or IP-oriented extension services within the WPRS region.

In the case of the 2nd edition of this guideline notes taken during the preparation of the first edition were of special value as were the existing guidelines of advanced European IP programs already in operation, and last but not least the input of the more than 30 experts included in the consultation.

We would like to extend our thanks to all persons that assisted in the preparation of this document by their direct input and advice. Most of them have already participated in the discussions and meetings held for the preparation of the preliminary document published in 1996. Special thanks go to those colleagues who translated the English text of the original document into the respective other languages.

The final text of the 2nd edition was read and approved by the Commission on February 15, 1999.

Carlo Malavolta
Co-Editor
Member of Commission

Ernst F. Boller
Co-Editor
Chairman of Commission

Preface of the first edition 1996

The production of high quality grapes, the guarantee of a reasonable income for the wine-grower, the safeguarding of the special patrimony of viticulture and the protection of the environment - these are the challenges facing wine-growers, scientists and advisors as well. Integrated Production is an interesting approach to realise sustainable viticulture. However, a certain set of common rules is necessary to implement Integrated Production in the different wine-growing regions of Europe. The IOBC/WPRS Working Group on viticulture has taken the initiative to develop technical guidelines to address this need.

The technical guidelines for Integrated Production of grapes in Europe presented here after 3 years of preparation are the outcome of numerous expert meetings (Geneva 1993, Bordeaux 1993, Paris 1994 and Freiburg 1995). They also incorporate a large number of additional oral and written proposals submitted by individuals inside and outside the WPRS-region and reflect the experience and approach taken in the different wine-growing regions. The guidelines could not go into details, where the regional requirements, their specific situation and socio-economic context need to be addressed in more precise regional IP-guidelines.

We most gratefully acknowledge the valuable input of the colleagues who participated in the meetings or expressed their ideas and criticism during the consultation phase of the document:

Agulhon R. (F), Amaro P. (P), Baillod M. (CH), Barralis G. (F), Basler P. (CH), Boller E. (CH) Borgho M. (I), Bourquin- H.-D. (D), Boursiquot J.-M. (F), Caronneau A. (F), Corino L. (I), Cortada R.V. (CH), Coulon (F), Desbaillet G. (CH) Finger H. (D), Gut D. (CH), Hardy P. (F), Hill G. (D), Imbioglini G. (I), Kast W. (D), Köble J. (D), Kreiter S. (F), Lafon R. (F), Leclant J. (F), Louis F. (D), Lozzia G. (I), Maillet J. (F), Malavolta C. (I), Montcombe D. (F), Murisier F. (CH), Panigai L. (F), Peinado Vacas J.-J. (E), Perez-Marin J.-L. (E), Riffiod G. (F), Rückrich K. (D), Rumbos J. (GR), Schruft G. (D), Sentenac G. (F).

We also like to extend our sincere thanks to those colleagues who participated in the translation of the original French text into the other languages:

Amaro P., Avilla J., Boller E., Candolfi-Vasconcelos C., Corino L., Cross J., Duvernay C. and Schruft G.

With these general guidelines at hand the continued joint effort of the profession and research is essential to work on the future development of existing regional guidelines as by definition Integrated Production is a dynamic process. The practical implementation needs the involvement of the wine-growers, scientists, continuous education and technical assistance. But only the motivation and active involvement of the wine-growers can make sure that viticulture becomes and remains a dynamic and sustainable production system.

Bernadette Dubos
Convenor of the IOBC/WPRS
Working Group Viticulture

Augustin Schmid
Chairman of the sub-group
Practical Application

International Organisation for Biological and Integrated Control
of Noxious Animals and Plants

GUIDELINES FOR INTEGRATED PRODUCTION OF GRAPES

IOBC TECHNICAL GUIDELINE III
2007. 3rd Edition

(Original text in English)

This document sets out general principles, minimum standards and guidelines for Integrated Production of table grapes and grapes for wine production. It is intended as a framework for the formulation of specific regional or national guidelines according to IOBC standards and to facilitate their harmonisation.

The requirements for Integrated Production of grapes as defined in this document are based on the IOBC Principles of Integrated Production and Technical Guidelines I and II (3rd edition) published in the IOBC/WPRS Bulletin Vol. 27 (2), 2004 and available in full text on internet www.iobc.ch. These documents or up-dated versions thereof, are integral parts of these crop specific Technical Guidelines III.

I. DEFINITION AND OBJECTIVES

In the framework of the general IOBC definition of Integrated Production, Integrated Production of grapes is defined as the economical production of high quality grapes, giving priority to ecologically safer methods, minimising the use and undesirable side effects of agro-chemicals and to enhance the safeguards to the environment and human health.

Based on this short definition Integrated Production of grapes emphasises the following **objectives**:

- To promote production systems that respect the environment, are economically viable, and sustain the multiple functions of agriculture, namely its social, cultural and recreational aspects;
- To secure a sustainable production of healthy grapes of high quality and with a minimum occurrence of pesticide residues;
- To protect the farmers' health when handling agro-chemicals;
- To promote and maintain a high biological diversity in the ecosystem of the vineyard and in surrounding areas;
- To give priority to the use of natural regulating mechanisms;
- To preserve and promote long-term soil fertility;
- To minimise pollution of water, soil and air.

II. REQUIREMENTS

1. Formal Requirements for IP Organisations and their Members

1.1. Organisations: Basic requirements, inspection procedures and guideline structure

National or regional IP-organisations applying for endorsement by the IOBC Commission on 'IP-Guidelines and Endorsement' have to fulfil the basic requirement defined by the "Admission Criteria for Organisations seeking IOBC Endorsement" (see www.iobc.ch). They have to organise and operate their inspection and certification systems according to the standards defined in the Technical IOBC Guideline I and its Appendices 2 and 3 (3rd edition 2004 or more recent version). With respect to the establishment of flexible national and regional guidelines, we refer to the recommendations given in Appendix 1 of the Technical Guideline I and in the "IOBC Tool Box" published by the IOBC Commission on internet www.iobc.ch.

1.2 Professionally trained, environmentally and safety conscious growers

Successful Integrated Production requires professional, up-to-date training and a positive and sympathetic attitude to its aims. The requirements for the farmer (member of the regional IP-organisation) are defined by the IOBC Technical Guideline I and are summarised as follows:

The farmer or responsible farm manager must:

- Be professionally qualified to manage the farm according to IP principles;
- Be a member of an officially recognised IP association and has to sign a contract defining clearly the duties as member;
- Have a thorough knowledge of the aims and principles of Integrated Production and of regional IP-guidelines and standards and should have a positive and sympathetic attitude to environmental conservation and human health and safety.
- Undertake basic training and education in IP, and participate actively in the regular updating courses offered by his/her IP organisation;
- Make complete farm records demonstrating essential farm operations such as fertilisation, pesticide applications, soil management, irrigation, according to the rules of the IP association.
- Carry out each year (preferably before harvest) a self-evaluation by completing the check-list (= inspection protocol) of the organisation (Technical Guideline II, point 1.4).

2. Conserving the Vineyard Environment: Biodiversity and Ecological Infrastructures

An important aim and requirement of Integrated Production in viticulture is the conservation of the vineyard environment, its habitats and wildlife. They must not be detrimentally altered nor polluted.

A balanced and natural vineyard environment with a diverse agro-ecosystem of plants and animals must be created and conserved. According to IOBC standards at least 5% of the *entire farm area* (excluding forests) have to be identified and managed as ecological infrastructure (= ecological compensation area) with no input of pesticides and fertilisers in order to enhance botanical and faunistic biodiversity. The area of ecological infrastructures should eventually increase to 10%.

In areas with predominantly perennial crops and small farms, where a surface of 5% or more of a common and homogeneous agroclimatic unit (e.g. municipal district) has been set aside as ecological compensation area by official and well documented regional programs, the 5% rule has not necessarily to be applied to the individual farm.

Existing ecological infrastructures on the farms must be preserved. Headland attractants (flowering field margins) should be established as reservoirs of pest antagonists. Regional organisations must establish lists of plants to be avoided (e.g. sources of infestations of major diseases, viruses etc). Areas of linear elements (e.g. flowering border strips, hedges, ditches, stone walls) and non-linear elements (e.g. groups of trees, ponds, etc.) present on the farm or planned should be combined in a manner to obtain spatial and temporal continuity as a prerequisite for the enhancement of faunistic diversity and for the maintenance of a diverse landscape. (Practical examples on the evaluation of the ecological quality of the infrastructures, their functions, establishment and maintenance are given in the IOBC Toolbox on internet www.iobc.ch).

Important elements of ecological infrastructures in vineyards are e.g. border areas and slopes of terraced plots rich in plant species, stone walls and ruderal areas. Particular attention must be devoted to headlands and hedges. High diversity of their composition and structure should be the aim, using or encouraging where possible native species.

A green cover during winter is mandatory (see below Chapter 4).

National/regional guidelines have to provide a list of possible options for the active enhancement of biological diversity. At least two of these ecological options have to be chosen and implemented by each member.

3. Site Selection and Preparation

For new vineyards, site, rootstocks, cultivar, planting systems must be selected and harmonised so that stable yields of quality grapes, and hence economic success, can be expected with a minimum use of agrochemicals and environmentally hazardous practices. Frost pockets and sites with poor drainage must be avoided.

Analysis and preparation of the soil prior to planting

The measures must consist of:

- soil analysis: texture, organic matter, macro nutrients (at least P, K, Mg);
- basic fertilisation with organic and/or mineral components if necessary;
- land improvement if necessary (e.g. drainage, increasing content of organic matter where below 1%);
- thorough elimination of sources of disease inoculum (i.e. roots of old vines);
- elimination of perennial problem weeds.

Large scale interventions (e.g. excavations and land-fillings) should be examined critically with respect of their environmental impact and destruction of a diversified topography and existing ecological compensation areas.

The "devitalisation" before removal of virus infested vines (fan leaf or phytoplasma) is recommended in areas where applicable. A fallow is highly recommended, if possible with flowering cover plants. In case of infections by root rot agents (e.g. *Armillaria* spp.) in the previous crop, this practice is crucial.

Chemical soil sterilisation is not permitted.

4. Site Management: Alleyways and Weed-free Strip

The aims of establishing alleyways with cover plants are to avoid soil erosion and compaction without detriment to yield and quality, to maintain and enhance plant species diversity in the vineyard to increase ecological stability, and to minimise the use of herbicides.

Total green cover during winter is mandatory. The procedures for practical implementation must be defined in the guidelines according to climate, soil type and grape varieties. In areas with sufficient precipitation and suitable soil type the maintenance of a permanent or temporary green cover during the growth season is highly recommended. In areas with precipitation of >500 mm during the growth season, it is recommended to increase biodiversity of high quality within the vineyards (e.g. by practising an alternating mowing regime with a permanent supply of flowering plants as food sources for the vineyard fauna).

Where soil moisture is adequate during the vegetation period overall bare soil management (total weed control) of vineyards is not permitted except in new plantations (maximum period of 3 years). The exceptional and highly restrictive use of herbicides with low persistence on the entire surface of a plot must be defined clearly in the guidelines and can only be permitted during spring and summer months for certain situations (e.g. in existing narrow planting systems with row distances < 1.5 m and/or existing low training systems).

Where possible, the use of herbicides should be replaced by mechanical cultivation, soil cover with organic materials and above all by partial or total green cover. Regional or national guidelines must specify a maximum width for the weed free strip.

5. Rootstocks, Cultivar and Planting Systems for New Vineyards

Cultivars and clones resistant to diseases and/or pests as well as a diversification of cultivars and rootstocks are recommended. Planting material should be sound and certified as virus-tested. Where this is not available, planting material of the highest health status available must be used. Narrow planting systems must be avoided whenever possible, as they require in most cases soil management practises that are in contradiction to the aims of IP (e.g. total surface application of herbicides).

New plantations should maintain a distance of at least 10m from surface water.

Training systems

For the choice of training systems preference must be given to training systems facilitating the application of cultural techniques that favour:

- the production of high quality grapes;
- vine longevity;
- biological diversity (botanical and zoological);
- the protection of soil against erosion;
- a reduction of conditions favouring the development of insect pests and diseases;
- a more efficient application of pesticides;
- a reduction of the amount of pesticides applied;
- the recycling of spray drift (e.g. recovery panels).

Very low training systems are not recommended. Grapevines must be trained and pruned to achieve a balance between growth and stable yields and to allow good penetration of light and sprays.

Proper ventilation of the grape zone in humid areas is an important and mandatory prophylactic measure against diseases (especially *Botrytis*).

6. Nutrition

The structure, depth, fertility, fauna and microflora of the soil must be conserved and nutrients and organic matter recycled where possible. Restricted quantities of fertilisers consistent with high grape quality, plant health and the mineral and organic nutrient reserves in the soil may only be used if chemical analysis of soil or plant material shows they are justified. Ground water pollution by fertilisers, especially nitrates, must be avoided.

Whenever fertilisers are to be applied after planting, soil and/or plant analysis must be done on a regular basis, to determine nutrient and fertiliser requirements. Regional or national guidelines must define the maximum interval between soil analyses and set out clear methods by which requirements are determined, including sampling and analytical procedures and rules for decision making (see Technical Guideline II, chapter 6).

The maximum permitted nitrogen input (expressed in kg N/ha/year and per ton of grapes harvested per ha) and period of application (e.g. from BBCH stage 15 until stage 68) must be defined in the guidelines. It is recommended that in established vineyards the maximum amount of nitrogen be set at 5 kg N (per ha and year) per ton of grapes harvested. In cases where green covers are established for the first time and therefore additional biomass has to be produced it is recommended to add to this calculated total amount of N during a period of 4-5 years an additional amount of 30-50 kg N/ha/year. The total amount of available nitrogen in organic fertilisers should be accounted for a period of 3 years. IP growers should be encouraged to reduce the amount of nitrogen whenever possible to minimise leaching (e.g. by observation of the green coloration of the leaves. A dark green colour of the leaves suggests in most cases that the nitrogen fertilisation can be reduced)

The applied amount of K and P indicated by the soil or plant analysis should not exceed the indicated amount by more than 10% except for organic fertilisers applied every second or third year.

Where foliar symptoms indicate a deficiency of micronutrients these elements should be administered normally via the root system. Foliar sprays should be restricted to clearly defined and justified cases.

Fertilisers or manure contaminated with toxic or environmentally hazardous substances such as heavy metals or pathogenic micro-organisms are not permitted.

7. Irrigation

Irrigation must be applied according to need. Excessive soil moisture may result in leaching of nutrients. Excessive use of irrigation water is wasteful. In vineyards where irrigation is required, daily rainfall must be measured and the soil moisture deficit estimated. Irrigation water of adequate quality (conductivity, Cl-content) must be supplied according to the soil moisture deficit and the water storing capacity of the soil. Regional guidelines have to define the maximum water volume not to be surpassed.

Irrigation of vines for wine production must not be applied after véraison (BBCH-Scale 81-85) or highly restricted as specified by the regional guidelines in order to guarantee the good quality of the wine.

8. Integrated Plant Protection

8.1 Principles of Integrated Plant Protection

The modern approach to Integrated Plant Protection in the context of sustainable production systems has been described in Technical Guideline II (2004) and can be summarised as follows:

Preventive (indirect) measures and observations in the field on the pest, disease and weed status must have been considered before intervention with direct plant protection measures takes place.

For further details on plant protection strategies we refer to the IOBC Technical Guideline II (2004) and its Appendices 4 and 5, respectively.

Prevention (= indirect plant protection)

The prevention and/or suppression of key pests and diseases should be supported among other options especially by the

- choice of appropriate resistant/tolerant cultivars;
- use of adequate cultivation techniques (e.g. green cover, alternate mowing, defoliation of grape zone);
- use of optimum fertilization (especially low nitrogen input) and irrigation practices;
- protection and enhancement of beneficial organisms (e.g. predatory mites, parasitoids);
- utilisation of ecological infrastructures inside and outside production sites to enhance a supportive conservation biological control of key pests by antagonists.
- Each IOBC endorsed regional IP-organisation must establish for each geographically defined production zone a list of key pests, key diseases and key weeds that require regular control measures in the region concerned and a list of the most important known antagonist(s) of the key pests (“Passport” - see also 8.3)

Risk assessment and monitoring

Basically, all available prophylactic measures (= indirect plant protection) must be applied before direct control measures are used. The decision for the application of direct control methods is based on economic thresholds (tolerance levels), risk assessment and the services provided by official forecasting services (prognoses).

Populations of pests and diseases must be regularly monitored and recorded. Scientifically established assessment methods appropriate to the region or locality must be used. For each pest or disease the approximate level of infestation or the risk of damage must be estimated. The decision, if a treatment is necessary, must be based on scientifically established threshold levels and the official forecasts of pest and/or disease occurrence and risks. Existing and validated forecasting models for diseases should be used and the use of adequate monitoring devices by groups of growers recommended.

Direct plant protection measures (= control)

Where indirect plant protection measures are not sufficient to solve the problem and the forecasting operations and threshold values indicate a necessity of intervention with direct plant protection measures, priority must be given to measures with minimum impact on human health, non-target organisms and the environment. Biological, biotechnical* and physical methods must be preferred to chemical methods if they provide satisfactory control. Where phytoseiid predators are absent from vineyards, they must be introduced where the pest situation (e.g. spider mites, thrips) requires regular control measures.

(*Biotechnical control methods are defined as highly specific procedures that influence the behaviour or development of pests without direct biocidal activity, such as mating disruption, selective attractants and traps, deterrents, sterile insect technique. They do not include genetically modified organisms/ GMOs).

8.2 The choice of direct plant protection methods (= control)

All agrochemicals used must fulfil the basic requirements of GAP as detailed in the IOBC Technical Guideline II. All crop protection products applied must be officially registered or permitted by the appropriate governmental organisation in the country of application and final destination of produce (especially table grapes). Where no official registration scheme exists reference is made to the FAO Code of Conduct on the Distribution and Use of Pesticides.

The crop protection product applied must be appropriate for the target as recommended on the product label or for officially approved off-label uses.

The choice of pesticides in *sustainable production schemes* and their classification into 'permitted'(green), 'permitted with restrictions' (yellow) and 'not permitted' (red) categories must consider:

- Their toxicity to man
- Toxicity to key natural enemies
- Toxicity to other natural organisms
- Pollution potential for the environment (soil, water, air)
- Properties which could enhance pest and disease problems
- Selectivity
- Persistence
- Potential to develop resistance in target
- Incomplete or missing information
- Necessity of use

Regularly updated data on the side-effects of pesticides are compiled and published by IOBC (see IOBC Toolbox on internet www.iobc.ch) and must be taken into account. Based on these criteria the following pesticides or pesticide groups are not permitted:

- Pyrethroid insecticides and pyrethroid acaricides;
- Organochlorine insecticides and organochlorine acaricides if safer alternatives exist;
- All acaricides toxic to Phytoseiid mites;
- Toxic, water polluting or very persistent herbicides (e.g. Diquat, Paraquat).

8.3 Lists to be compiled by IOBC endorsed regional IP organisations

Each IOBC-endorsed regional IP-organisation must establish for each geographically defined production zone:

- a list of key pests, key diseases and key weeds that require regular protection measures in the region concerned and
- a list of the most important known antagonist(s) of the key pests (“Passport”). At least two key natural enemies (one of them usually a Phytoseiid mite, the second one representing important insect parasitoids or predators) must be identified and their protection and augmentation be declared important.
- a list of field-evaluated, available and recommended indirect plant protection measures (= prevention) as important part of the “Green list of plant protection measures” (see 8.1 and IOBC Toolbox www.iobc.ch) .
- a selective list of officially registered pest control measures, divided clearly into those that can be used without restrictions in the IP program ("green list") and into those products that can only be used with clearly defined restrictions ("yellow list"). The IP organisation applying for IOBC endorsement must prove that either no ecologically safer alternative is available or that the active ingredient is necessary for a planned pesticide resistance management. Guidelines must define clearly the restrictions and permitted indications. Some examples are:
 - Broad-spectrum organo-phosphate and carbamate insecticides: precise indication and maximum number of applications;
 - Dithiocarbamate fungicides (maximum of 3 applications per season and not in succession, so that predatory Phytoseiid mites are not affected);
 - Sulphur (dosage must be limited to non-toxic levels so that predatory Phytoseiid mites are not affected);
 - Fungicides and insecticides with high potential to develop resistance (maximum number of applications to be clearly defined);
 - Copper (guidelines have to define the maximum amount in kg per ha and year);
 - Residual herbicides with dt90 < 1 vegetation period: the situations of their exceptional use must be clearly specified;

8.4 Application of pesticides and recording of pesticide treatments

For full details see Technical Guidelines II, chapter 8.4

There must be documented evidence on the application according to label instructions and that the application has been accurately calculated and prepared. Label doses are, however, maximum doses approved by the registration authorities. Reduced dosages are possible (especially in herbicides) if applied on the user’s own risk (declined liability of companies) and if pesticide resistance management criteria (especially fungicides) do not require the full dosage.

The official pre-harvest intervals must be followed and should, if possible, be extended to minimise pesticide residues. They must be recorded for all crop protection product applications made and evidence provided that they have been observed. In situations with multiple harvest periods, systems must be in place in the field to ensure fail-safe compliance (e.g. warning signs).

8.5 Efficient and safe storage and handling of pesticides

The basic requirements of Good Agricultural Practice (GAP) with respect to storage, safe handling and disposal of pesticides and to the operation and maintenance of spray equipments must be fulfilled. They are listed in IOBC Technical Guideline II (8.5) and must be outlined in detail in IOBC endorsed regional IP guidelines.

The following selected list of mandatory requirements include some of the general aspects and address the specific situation in grape production as follows:

8.5.1 Safety and Handling: There must be adequate facilities for measuring, mixing and filling the pesticide products. Adequate emergency facilities must be provided to deal with potential operator contamination, such as running water, eyewash facilities, first aid box and emergency procedures. The emergency plan must include a list of emergency telephone numbers and the location of the nearest telephone. Operators must have appropriate protective clothing and equipment for all operations involving chemicals. Obligation to prevent any overflow and return of mix in the drinkable water supply network (control during filling, water hose kept out of the mix tank during filling up, etc.)

The installation of a surface for mix preparation/washing of the sprayers allowing the collecting of the effluents is recommended.

All sprayer filling up or washing near a river must be avoided.

8.5.2 Application and Training: The use of best application techniques available to minimize drift and loss is highly recommended for example direct treatment on each face of the row. Treatments directed on bunches must be realized face by face (example in the case of *Botrytis*).

All sprayer operators must have appropriate training and hold, where relevant, the appropriate certificate of competence. Operators on training for the certificate of competence must be supervised during pesticide application according to national rules.

8.5.3 Storage: The regulations on storage are numerous and contain in certain GAP standards close to 20 “must” items. Pesticides must be stored in accordance to local regulations, in a locked room and separated from other materials. Keys and access to the pesticide store must be limited to workers with formal training in the handling of pesticides. Pesticides must only be stored in their original package. Only pesticides that are approved for use on the crops must be stored in the same room; crop protection products used for purposes other than application on crops according to IOBC endorsed IP programs must be clearly identified and stored separated from “green” and “yellow list” products.

A specific training on the risks related on the exposure of the plant health products and on the means of prevention is obligatory.

8.6 Spray equipment

Spraying equipment and spraying conditions minimising the health risk of the operator and drift should be preferred. Spraying in windy conditions is not permitted.

Sprayers must be calibrated at the beginning of each season and their proper functioning should be checked before each treatment. The number of nozzles must be adapted according to the height of foliage (close the useless nozzles). The spray impact on the environment can be minimised by the proper calculation of the amount of product needed per ha depending on

the phenological stage of the vine. For the establishment of rules concerning the appropriate amount of product to be used it is recommended to calculate the leaf surface of the fully developed canopy of a given planting and training system.

Sprayers must be calibrated annually by the grower and serviced by a recognised agent at least every four years.

When new sprayers are purchased, transverse flow design, tunnel sprayers or sprayers allowing treatment of each side of the row should where possible be selected. Atomizers must be equipped with stop drop system on the nozzles. Helicopter spraying should be restricted to cases without viable alternatives or with advantages in terms of reduced impacts on health and the environment, e.g. in steep-slope viticulture; prohibition of oscillating spraying materials except exemption (see Technical Guidelines II, chapter 8.6).

8.7 Disposal of surplus mix, obsolete pesticides and empty containers:

Under normal circumstances surplus spray mix should not occur. However, if surplus should occur, disposal must comply with local regulations. Surplus application mix or tank washings must be either disposed of by a registered waste contractor or by spraying the surplus of mix added with water on the vines or grass sidewalks.

When surplus mix or tank washings are applied onto designated fallow land, it must be demonstrated that this is legal practice and there is no risk of surface water contamination.

An optimal management of the effluents of the sprayer in the vine plot is recommended (limitation of the surplus mix, successive sequential dilution with re spraying on the vine, draining the last remainder in the plot). The safe disposal of redundant pesticides must be planned and recorded, and obsolete pesticides must only be disposed of through an approved chemical waste contractor. Empty pesticide containers must be rinsed with water three times and the rinsate returned to the spray tank. Empty containers must not be re-used and should be crushed or perforated to prevent re-use. It is forbidden burn or bury this packing. They must be eliminated via the household refuse (if authorized) or specific organization.

8.8 Pesticide residues

Statutory maximum residue levels must be observed. The occurrence of pesticide residues on grapes at harvest – especially table grapes – must be further minimised by maximising safe-to-harvest intervals.

9. Harvest and Post-harvest Management of Table Grapes

Harvest and post-harvest handling practices of table grapes have to fulfil the general requirements for product quality, food safety and traceability established by national or international food safety standards and are outlined in the IOBC Technical Guideline II (chapters 9 and 10). Some selected “must” items are listed below.

Hygiene: All staff must be aware of the need to harvest, transport and handle table grapes with care, having received basic training in personal hygiene requirements for handling of fresh produce.

A documented and up-dated risk assessment covering hygiene aspects of the harvest process and of produce handling operations must be made and hygiene procedures be implemented.

Workers must be provided with clean, fixed or mobile toilet facilities at all permanent sites and in vicinity of fieldwork.

Staff must have access to clean hand washing facilities in the vicinity of their work.

Chemical post-harvest treatments must not be applied to table grapes excepted for sulphur dioxide used as a technological process and when justified by long conservation periods and specific risk assessment.

10. Vinification

IOBC does not establish guidelines for vinification. However, IOBC-endorsed organisations are required to present their internal guidelines for vinification that must not only respect legal requirements of their country and of potential markets but strive for highest quality parameters.

11. Animal Production on Mixed Farms

See Technical Guidelines II (chapter 11)

12. Workers' Health, Safety and Welfare

The aspects of the workers' health, safety and welfare are detailed in IOBC Technical Guideline I (2004) and in the "Admission Criteria for Organisations seeking IOBC Endorsement", respectively. The criteria are those outlined in the Declaration of the International Labour Organisation (www.ilo.org), an organisation of the United Nations.

III. Selected literature (* available in full text on internet www.iobc.ch)

*Boller, E.F.; Avilla, J.; Gendrier, J.P.; Jörg, E.; Malavolta, C. 1998. Integrated Production in Europe: 20 years after the declaration of Ovrannaz. – IOBC/WPRS Bulletin 21(1), 41 pp.

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Coulon, T.; Sentenac, G. 2003. Proposal of review of the third OILB Technical Guideline for the Integrated Production of Grapes. Proceedings of Working Group 'Integrated Protection and Production in Viticulture' Volos (Hellas), 18-22 March, 2003. – IOBC/wprs Bulletin 26(8): 297-301.

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