



European Union
Community Plant Variety Office

PROTOCOL FOR DISTINCTNESS, UNIFORMITY AND STABILITY TESTS

Malus domestica Borkh.

APPLE

UPOV Species Code: MALUS_DOM

Adopted on 14/03/2006

I SUBJECT OF THE PROTOCOL

The protocol describes the technical procedures to be followed in order to meet the Council Regulation 2100/94 on Community Plant Variety Rights. The technical procedures have been agreed by the Administrative Council and are based on general UPOV Document TG/1/3 and UPOV Guideline TG/14/9 dated 06/04/2005 for the conduct of tests for Distinctness, Uniformity and Stability. This protocol applies to fruit varieties of *Malus domestica* Borkh..

II SUBMISSION OF SEED AND OTHER PLANT MATERIAL

1. The Community Plant Variety Office (CPVO) is responsible for informing the applicant of

- the closing date for the receipt of plant material;
- the minimum amount and quality of plant material required;
- the examination office to which material is to be sent.

A sub-sample of the material submitted for test will be held in the variety collection as the definitive sample of the candidate variety.

The applicant is responsible for ensuring compliance with any customs and plant health requirements including the presentation of an appropriate phytosanitary certificate.

2. Final dates for receipt of documentation and material by the Examination Office

The final dates for receipt of requests, technical questionnaires and the final date or submission period for plant material will be decided by the CPVO and each Examination Office chosen.

The Examination Office is responsible for immediately acknowledging the receipt of requests for testing, and technical questionnaires. Immediately after the closing date for the receipt of plant material the Examination Office should inform the CPVO whether acceptable plant material has been received or not. However if unsatisfactory plant material is submitted the CPVO should be informed as soon as possible.

3. Plant material requirements

The current quality and quantity requirements as well as the final dates for submission of the plant material are available on the CPVO website (www.cpvo.europa.eu) and are published in the CPVO gazette 'S2'.

Quality of plants: Should not be less than the standards laid down in Council Directive 77/93/EEC and 2000/29/EC and their amendments concerning quarantine organisms, and Council Directive 92/34/EEC and Commission Directive 93/48/EEC and their amendments concerning organisms impairing quality, at the date of adoption of this protocol; please refer to "Eur-Lex" for the full text and in case of any subsequent amendments to the three aforesaid Directives.

Quarantine organism (Directive 77/93/EEC and 2000/29/EC). The plant material must be free from:

Insects, mites and nematodes at all stages of their development

- *Acleris* spp. (non-European)
- *Amauromyza maculosa*
- *Anomala orientalis*
- *Anoplophora chinensis*
- *Anoplophora malasiaca*
- *Arrhenodes minutus*
- *Bemisia tabaci* (non-European populations)
- *Carposina niponensis*
- *Choristoneura* spp. (non-European)
- *Cicadellidae* (non-European)
- *Conotrachelus nenuphar*
- *Enarmonia prunivora*
- *Enarmonia packardi*
- *Globodera pallida*
- *Globodera rostochiensis*
- *Grapholita inopinata*
- *Heliothis armigera*
- *Heliothis zea*
- *Liriomyza bryoniae*
- *Liriomyza huidobrensis*
- *Liriomyza trifolii*
- *Liriomyza sativae*
- *Longidorus diadecturus*
- *Monochamus* spp. (non-European)
- *Myndus crudus*
- *Nacobbus aberrans*
- *Opogona sacchari*
- *Popilia japonica*
- *Premnotrypes* spp. (non-European)

- *Pseudopityophthorus minutissimus*
- *Pseudopityophthorus pruinus*
- *Scaphoideus luteolus*
- *Spodoptera eridania*
- *Spodoptera frugiperda*
- *Spodoptera littoralis*
- *Spodoptera litura*
- *Tephritidae* (non-European)
- *Trachypterellus quadrigibbus*
- *Thrips palmi*
- *Xiphinema americanum* (non-European populations)
- *Xiphinema californicum*

Bacteria

- *Clavibacter michiganensis*
- *Erwinia amylovora*
- *Pseudomonas solanacearum*
- *Xylella fastidiosa*

Fungi

- *Alternaria alternata*
- *Ceratocystis fagacearum*
- *Chrysomya arctostaphyli*
- *Cronartium* spp. (non-European)
- *Endocronartium* spp. (non-European)
- *Guignardia laricina*
- *Guignardia piricola*
- *Gymnosporangium* spp. (non-European)
- *Inonotus weirii*
- *Melampsora medusae*
- *Melampsora farlowii*
- *Monilinia fructicola*
- *Mycosphaerella larici-leptolepis*
- *Mycosphaerella populorum*
- *Phoma andina*
- *Phyllosticta solitaria*
- *Septoria lycopersici*
- *Synchytrium endobioticum*
- *Thecaphora solani*
- *Trechispora brinkmannii*

Viruses and virus-like organisms

1. Elm phloem mycoplasma
2. Potato viruses and virus-like organisms such as:
 - Andean potato latent virus
 - Andean potato mottle virus
 - Arracha virus B, oca strain
 - Potato black ringspot virus
 - Potato spindle tuber viroid
 - Potato virus T

- Non-European isolates of potato viruses A, M, S, V, X and Y (including Yo, Yn and Yc) and Potato leafroll virus
- 3. Tobacco ringspot virus
- 4. Tomato ringspot virus
- 5. Viruses and virus-like organisms of *Cydonia* Mill., *Fragaria* L., *Malus* Mill., *Prunus* L., *Pyrus* L., *Ribes* L., *Rubus* L., and *Vitis* L., such as:
 - Apple proliferation mycoplasma
 - Apricot chlorotic leafroll mycoplasma
 - Blueberry leaf mottle virus
 - Cherry rasp leaf mottle virus (American)
 - Peach mosaic virus (American)
 - Peach phony rickettsia
 - Peach rosette mosaic virus
 - Peach rosette mycoplasma
 - Peach-X disease mycoplasma
 - Peach yellows mycoplasma
 - Pear decline mycoplasma
 - Plum line pattern virus (American)
 - Raspberry leaf curl virus (American)
 - Strawberry latent “C” virus
 - Strawberry vein banding virus
 - Strawberry witches’ broom mycoplasma
- 6. Viruses transmitted by *Bemisia tabaci* Genn, such as:
 - Bean golden mosaic virus
 - Cowpea mild mottle virus
 - Lettuce infectious yellows virus
 - Pepper mild tigré virus
 - Squash leaf curl virus
 - Euphorbia mosaic virus
 - Florida tomato virus

Parasitic plants

- *Arceuthobium* spp. (non-European)

Organisms impairing quality (Directive 92/34/EEC and 93/48/EEC. The plant material must, at least on visual inspection, be substantially free from any harmful organisms and diseases impairing quality or any signs or symptoms thereof and in particular be free from:

Insects, mites and nematodes at all stages of their development

- *Anarsia lineatella*
- *Eriosoma lanigerum*
- Scale insects, in particular
Epidiaspis leperii, *Pseudaulacaspis pentagona*,
Quadraspidiotus perniciosus

Bacteria

- *Agrobacterium tumefaciens*
- *Pseudomonas syringae* pv. *syringae*

Fungi

- *Armillariella mellea*
- *Chondrostereum purpureum*
- *Nectria galligena*
- *Phytophthora cactorum*
- *Rosellinia necatrix*
- *Venturia* spp.
- *Verticillium* spp.

Viruses and virus-like organisms

- All (the plant material should at least be virus tested)

Chemical treatment: The plant material must not have undergone any treatment unless the CPVO and the examination office allow or request such treatment. If it has been treated, full details of the treatment must be given.

Labelling of individual plants in sample:

- Species
- File number of the application allocated by the CPVO
- Breeder's reference
- Examination office's reference (if known)
- Name of applicant
- The phrase "On request of the CPVO"

III CONDUCT OF TESTS

1. Variety collection

A variety collection will be maintained for the purpose of establishing distinctness of the candidate varieties in test. A variety collection may contain both living material and descriptive information. A variety will be included in a variety collection only if plant material is available to make a technical examination.

Pursuant to Article 7 of Council Regulation No. 2100/94, the basis for a collection should be the following:

- varieties listed or protected at the EU level or at least in one of the EEA Member States;
- varieties protected in other UPOV Member States;
- any other variety in common knowledge.

The composition of the variety collection in each Examination Office depends on the environmental conditions in which the Examination Office is located.

Variety collections will be held under conditions which ensure the long term maintenance of each accession. It is the responsibility of Examination Offices to replace reference material which has deteriorated or become depleted. Replacement material can only be introduced if appropriate tests confirm conformity with the existing reference material. If any difficulties arise for the replacement of reference material, Examination Offices must inform the CPVO. If authentic plant material of a variety cannot be supplied to an Examination Office the variety will be removed from the variety collection.

2. Material to be examined

Candidate varieties will be directly compared with other candidates for Community plant variety rights tested at the same Examination Office, and with appropriate varieties in the variety collection. When necessary an Examination Office may also include other candidates and varieties. Examination Offices should therefore make efforts to co-ordinate the work with other Offices involved in DUS testing of apple. There should be at least an exchange of technical questionnaires for each candidate variety, and during the test period, Examination Offices should notify each other and the CPVO of candidate varieties which are likely to present problems in establishing distinctness. In order to solve particular problems Examination Offices may exchange plant material.

3. Characteristics to be used

The characteristics to be used in DUS tests and preparation of descriptions shall be those referred to in the Annex 1. All the characteristics shall be used, providing that observation of a characteristic is not rendered impossible by the expression of any other characteristic, or the expression of a characteristic is prevented by the environmental conditions under which the test is conducted. In the latter case, the CPVO should be informed. In addition the existence of some other regulation e.g. plant health, may make the observation of the characteristic impossible.

The Administrative Council empowers the President, in accordance with Article 23 of Commission Regulation N° 1239/95, to insert additional characteristics and their expression in respect of a variety.

4. Grouping of varieties

The varieties and candidates to be compared will be divided into groups to facilitate the assessment of distinctness. Characteristics which are suitable for grouping purposes are those which are known from experience not to vary, or to vary only slightly, within a variety and which in their various states of expression are fairly evenly distributed throughout the collection. In the case of continuous grouping characteristics overlapping states of expression between adjacent groups is required to reduce the risks of incorrect allocation of candidates to groups. The characters used for grouping could be the following:

- a) Tree: type (characteristic 2)
- b) Only varieties with ramified tree type: Tree: habit (characteristic 3)
- c) Fruit: general shape (characteristic 28)
- d) Fruit: relative area of over colour (characteristic 36)
- e) Fruit: hue of over colour – with bloom removed (characteristic 37)
- f) Fruit: pattern of over colour (characteristic 39)
- g) Time of beginning of flowering (characteristic 55)
- h) Time of eating maturity (characteristic 57)

5. Trial designs and growing conditions

The minimum duration of tests (independent growing cycles) will normally include at least two satisfactory crops of fruit. Tests will be carried out under conditions ensuring normal growth. The size of the plots will be such that plants or parts of plants may be removed for measuring and counting without prejudice to the observations which must be made up to the end of the growing period.

The test design is as follows

Each test should be designed to result in a total of, at least, 5 trees for varieties resulting from crossing and 10 trees from varieties obtained from mutations.

Varieties resulting from crossing: All observations should be made on 5 trees or parts taken from each of 5 trees. Unless otherwise indicated, all observations determined by measuring or counting should be made on a minimum of 2 parts taken from each of the 5 plants.

Varieties resulting from mutation: All observations should be made on 10 trees or parts taken from each of 10 trees. Unless otherwise indicated, all observations determined by measuring or counting should be made on a minimum of 1 part taken from each of the ten plants.

Observations of the tree type and habit should be made on bare trees in winter.

Observations on the one-year-old shoots should be made on lateral dormant shoots in winter on trees that have completed at least one growing season at the testing centre.

Observations on tree vigour, leaf blade and petiole should be made in summer when the tree is in peak vegetative growth. Observations on the leaf blade and petiole should be made on fully developed leaves from the middle third of vigorous current season shoots from the outside of the tree.

Observations on the flower should be made on the second or subsequent flowers, at the start of anther dehiscence.

Observations of the type of bearing and on the young fruit should be made 40 days after flowering.

Observations on the fruit should be made on 10 typical fruits taken from a minimum sample of 20 at the time of ripeness for eating. The terminal (king) fruits should be excluded.

6. Special tests

In accordance with Article 83(3) of Council Regulation No. 2100/94 an applicant may claim either in the Technical Questionnaire or during the test that a candidate has a characteristic which would be helpful in establishing distinctness. If such a claim is made and is supported by reliable technical data, a special test may be undertaken providing that a technically acceptable test procedure can be devised.

Special tests will be undertaken, with the agreement of the President of CPVO, where distinctness is unlikely to be shown using the characters listed in the protocol.

7. Standards for decisions

a) **Distinctness**

A candidate variety will be considered to be distinct if it meets the requirements of Article 7 of Council Regulation No. 2100/94.

b) **Uniformity**

A candidate will be considered to be sufficiently uniform if the number of off-types does not exceed the number of plants as indicated in the table below. A population standard of 1% and an acceptance probability of 95% should be applied.

Table of maximum numbers of off-types allowed for uniformity standards.

| Number of plants | off-types allowed |
|------------------|-------------------|
| ≤ 5 | 0 |
| 6-35 | 1 |

c) **Stability**

A candidate will be considered to be sufficiently stable when there is no evidence to indicate that it lacks uniformity.

IV REPORTING OF RESULTS

After each recording season the results will be summarised and reported to the CPVO in the form of a UPOV model interim report in which any problems will be indicated under the headings distinctness, uniformity and stability. Candidates may meet the DUS standards after two fruiting periods but in some cases three fruiting periods may be required. When tests are completed the results will be sent by the Examination Office to the CPVO in the form of a UPOV model final report.

If it is considered that the candidate complies with the DUS standards, the final report will be accompanied by a variety description in the format recommended by UPOV. If not the reasons for failure and a summary of the test results will be included with the final report.

The CPVO must receive interim reports and final reports by the date agreed between the CPVO and the examination office.

Interim reports and final examination reports shall be signed by the responsible member of the staff of the Examination Office and shall expressly acknowledge the exclusive rights of disposal of CPVO.

V LIAISON WITH THE APPLICANT

If problems arise during the course of the test the CPVO should be informed immediately so that the information can be passed on to the applicant. Subject to prior agreement, the applicant may be directly informed at the same time as the CPVO particularly if a visit to the trial is advisable.

The interim report as well as the final report shall be sent by the Examination Office to the CPVO.

ANNEXES TO FOLLOW

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ANNEX II

Technical Questionnaire

ANNEX I

TABLE OF CHARACTERISTICS TO BE USED IN DUS-TEST AND PREPARATION OF DESCRIPTIONS

| CPVO N° | UPOV N° | Characteristics | Examples | Note | |
|-----------------|-----------------------|---|--------------------------|---------------------------------|---|
| 1. (+) QN | 1. (+) QN | Tree: vigour | very weak | Nield's Drooper | 1 |
| | | | weak | Akane | 3 |
| | | | medium | Golden Delicious | 5 |
| | | | strong | Bramley's Seedling | 7 |
| 2. (+) QL | 2. (* (+) QL | Tree: type | columnar | MacExcel, Wijcik | 1 |
| | | | ramified | Elstar, Golden Delicious | 2 |
| 3. (+) QN | 3. (* (+) QN | <u>Only varieties with ramified tree type: Tree: habit</u> | upright | Benoni, Gloster | 1 |
| | | | spreading | Bramley's Seedling, Jonagold | 2 |
| | | | drooping | Jonathan | 3 |
| | | | weeping | Nield's Drooper, Rome Beauty | 4 |
| 4. (+) QN | 4. (+) QN | Tree: type of bearing | on spurs only | Starkrimson Delicious | 1 |
| | | | on spurs and long shoots | Jonagold | 2 |
| | | | on long shoots only | Cortland, Rome Beauty | 3 |
| 5. (+) QN | 5. (+) QN | One-year-old shoot: thickness | thin | Laxton's Fortune, Remo | 3 |
| | | | medium | Jonagold | 5 |
| | | | thick | Bramley's Seedling | 7 |
| | | | very thick | Charlotte, Wijcik | 9 |

| CPVO N° | UPOV N° | Characteristics | Examples | Note | |
|----------------------|----------------------------|---|---------------------|----------------------------------|---|
| 6. (+) QN | 6. (* (+) QN | One-year-old shoot: length of internode | very short | MacExcel, Wijcik | 1 |
| | | | short | Alkmene, Florina | 3 |
| | | | medium | Jonagold, Redaphough | 5 |
| | | | long | Auralia | 7 |
| 7. PQ | 7. PQ | One-year-old shoot: colour on sunny side | greenish brown | Granny Smith | 1 |
| | | | reddish brown | Vicking | 2 |
| | | | light brown | Arkcharm | 3 |
| | | | medium brown | Golden Delicious | 4 |
| | | | dark brown | Ingrid Marie | 5 |
| 8. QN | 8. QN | One-year-old shoot: pubescence (on distal half of shoot) | absent or very weak | Laxton's Fortune, Rewena | 1 |
| | | | weak | Golden Delicious | 3 |
| | | | medium | Cox's Orange Pippin | 5 |
| | | | strong | Bramley's Seedling | 7 |
| | | | very strong | Rambour d'Hiver | 9 |
| 9. QN | 9. (* QN | One-year-old shoot: number of lenticels | few | Alkmene, Bramley's Seedling | 3 |
| | | | medium | Cox's Orange Pippin | 5 |
| | | | many | Mutsu | 7 |
| 10. (+) QN | 10. (* (+) QN | Leaf blade: attitude in relation to shoot | upwards | Katja, Redsleeves | 1 |
| | | | outwards | Bramley's Seedling | 2 |
| | | | downwards | Granny Smith, Schone van Boskoop | 3 |
| 11. QN | 11. (* (+) QN | Leaf blade: length | very short | Reanda | 1 |
| | | | short | Court Pendu Plat | 3 |
| | | | medium | Florina | 5 |
| | | | long | Bramley's Seedling | 7 |

| CPVO N° | UPOV N° | Characteristics | | Examples | Note | | |
|------------|------------|---|----------------|----------------------------|-----------------------------------|-----------------------------|---|
| 12. | 12. | Leaf blade: width | narrow | Cox's Orange Pippin | 3 | | |
| | | | (*) | medium | Jonagold | 5 | |
| | | | QN | QN | broad | Bramley's Seedling | 7 |
| 13. | 13. | Leaf blade: ratio length/width | small | Bramley's Seedling | 3 | | |
| | | | (*) | medium | Jonagold | 5 | |
| | | | QN | QN | large | Granny Smith | 7 |
| 14. | 14. | Leaf blade: intensity of green colour | light | Golden Delicious, Sansa | 3 | | |
| | | | QN | QN | medium | James Grieve | 5 |
| | | | | dark | Mutsu | 7 | |
| 15. (+) | 15. (+) | Leaf blade: incisions of margin (upper half) | crenate | Summerred | 1 | | |
| | | | PQ | PQ | bicrenate | Alkmene, Jim Brian | 2 |
| | | | | serrate type 1 | Elstar, Gala | 3 | |
| | | | | serrate type 2 | Sirprize | 4 | |
| | | | | biserrate | Freedom, Mutu, Schone van Boskoop | 5 | |
| 16. | 16. | Leaf blade: pubescence on lower side | absent or weak | Golden Delicious | 1 | | |
| | | | QN | QN | medium | Cox's Orange Pippin, Elstar | 2 |
| | | | | strong | James Grieve, Jonathan | 3 | |
| 17. | 17. | Petiole: length | short | Jonagold | 3 | | |
| | | | (*) | medium | Granny Smith | 5 | |
| | | | QN | QN | long | Falstaff | 7 |
| 18. | 18. | Petiole: extent of anthocyanin coloration from base | small | Golden Delicious, Jonagold | 3 | | |
| | | | QN | QN | medium | Cox's Orange Pippin, Gala | 5 |
| | | | | large | Discovery, Richared Delicious | 7 | |

| CPVO N° | UPOV N° | Characteristics | Examples | Note | |
|----------------|----------------------|--|----------------------|--|---|
| 19. (+) | 19. (* (+) | Flower: predominant colour at balloon stage | white | Norhey | 1 |
| | | | yellowish pink | Schöner aus Herrenhut, Worcester Pearmain | 2 |
| | | | light pink | Gravensteiner, Jonathan | 3 |
| | | | dark pink | Elstar, Sylvia | 4 |
| | | | medium red | Kidd's Orange Red | 5 |
| PQ | PQ | | dark red | Weirouge | 6 |
| | | | purple | Rafzubin | 7 |
| | | | very small | Freedom, Spätblühender Taffettapfel | 1 |
| | | | small | Jonafree | 3 |
| | | | medium | Cox's Orange Pippin | 5 |
| 20. QN | 20. (* QN | Flower: diameter with petals pressed into horizontal position | large | Schone van Boskoop | 7 |
| | | | free | Worcester Pearmain | 1 |
| | | | intermediate | Golden Delicious, Jonagold, Topaz | 2 |
| | | | overlapping | Schone van Boskoop | 3 |
| 21. (+) | 21. (* (+) | Flower: arrangement of petals | below | Alkmene | 1 |
| | | | same level | Cox's Orange Pippin | 2 |
| | | | above | Golden Delicious | 3 |
| 22. (+) | 22. (* (+) | Flower: position of stigmas relative to anthers | absent or very small | Grenadier, Norhey | 1 |
| | | | small | Fuji | 3 |
| | | | medium | Idared | 5 |
| | | | large | Elise | 7 |
| | | | very large | Weirouge | 9 |
| 23. QN | 23. QN | Young fruit: extent of anthocyanin overcolour | absent or very small | Grenadier, Norhey | 1 |
| | | | small | Fuji | 3 |
| | | | medium | Idared | 5 |
| | | | large | Elise | 7 |
| | | | very large | Weirouge | 9 |

| CPVO N° | UPOV N° | Characteristics | Examples | Note | |
|---------------|---------------------------------------|-------------------------------------|--------------------------|----------------------------|---|
| 24. QN | 24. (*) | Fruit: size | very small | Api Noir | 1 |
| | | | very small to small | Golden Harvey | 2 |
| | small | | Akane, Miller's Seedling | 3 | |
| | small to medium | | Alkmene | 4 | |
| | medium | | Cox's Orange Pippin | 5 | |
| | medium to large | | Gravensteiner | 6 | |
| | large | | Mutsu | 7 | |
| | large to very large | | Bramley's Seedling | 8 | |
| | very large | | Howgate Wonder | 9 | |
| 25. QN | 25. (*) (+) QN | Fruit: height | short | Auralia | 3 |
| | | | medium | James Grieve | 5 |
| | | | tall | Čadel, Iduna | 7 |
| 26. QN | 26. (*) (+) QN | Fruit: diameter | small | Orei | 3 |
| | | | medium | Golden Delicious | 5 |
| | | | large | Melrose | 7 |
| 27. QN | 27. (*) QN | Fruit: ratio height/diameter | very small | Court Pendu Plat, Ingol | 1 |
| | | | small | Idared, Ontario | 3 |
| | | | medium | Jonagold | 5 |
| | | | large | Golden Delicious | 7 |
| | | | very large | Iduna, Priam | 9 |
| 28. PQ | 28. (*) (+) PQ | Fruit: general shape | cylindrical waisted | Starkrimson Delicious | 1 |
| | | | conic | Jonagold | 2 |
| | | | ovoid | Summerred | 3 |
| | | | cylindrical | Gravensteiner, Mutsu | 4 |
| | | | ellipsoid | Spencer | 5 |
| | | | globose | Gloden Noble, Resi | 6 |
| | | | obloid | Bramley's Seddling, Idared | 7 |

| CPVO N° | UPOV N° | Characteristics | | Examples | Note | | |
|------------|------------|-------------------------------------|----------------|--|------------------------|---|---|
| 29. | 29. | Fruit: ribbing | absent or weak | Charles Ross, Discovery | 1 | | |
| | | | moderate | Golden Delicious | 2 | | |
| | | | strong | Red Delicious, Reinette Russet | 3 | | |
| 30. | 30. | Fruit: crowning at calyx end | absent or weak | Charles Ross, Discovery, Granny Smith | 1 | | |
| | | | moderate | Cox's Orange Pippin, Jonagold | 2 | | |
| | | | strong | Red Delicious | 3 | | |
| 31. | 31. | Fruit: size of eye | small | McIntosh | 3 | | |
| | | | (*) | medium | Cox's Orange Pippin | 5 | |
| | | | Q.N | Q.N | large | Ingol, Monarch | 7 |
| 32. | 32. | Fruit: length of sepal | short | McIntosh | 3 | | |
| | | | Q.N | Q.N | medium | Alkmene | 5 |
| | | | | | long | Gala | 7 |
| 33. | 33. | Fruit: bloom of skin | absent or weak | Golden Delicious | 1 | | |
| | | | (*) | moderate | James Grieve, Jonathan | 2 | |
| | | | Q.N | Q.N | strong | Vicking, Vista Bella | 3 |
| 34. | 34. | Fruit: greasiness of skin | absent or weak | Schone van Boskoop | 1 | | |
| | | | Q.N | Q.N | moderate | James Grieve | 2 |
| | | | | | strong | Arlet, Jonagold | 3 |
| 35. | 35. | Fruit: ground colour | not visible | Red Jonaprince | 1 | | |
| | | | (*) | whitish yellow | Silken | 2 | |
| | | | P.Q | P.Q | yellow | Delorgue, Gala, Transparente de Croncels | 3 |
| | | | | | whitish green | Angold, Lodi, Lena, White Transparent | 4 |
| | | | | | yellow green | Cox's Orange Pippin | 5 |
| | | green | Granny Smith | 6 | | | |

| CPVO N° | UPOV N° | Characteristics | Examples | Note | | |
|------------|------------|---|--|--|--|---|
| 36. | 36. | Fruit: relative area of over colour | absent or very small | Granny Smith | 1 | |
| | (*) | | small | Auralia, Cox's Orange Pippin | 3 | |
| | QN | | QN | medium | Gala | 5 |
| | | | large | Spartan | 7 | |
| | | | very large | Red Jonaprince | 9 | |
| 37. | 37. | Fruit: hue of over colour – with bloom removed | orange red | Cox's Orange Pippin, Egremont Russet | 1 | |
| | (*) | | pink red | Cripps Pink, Delorgue | 2 | |
| | PQ | | PQ | red | Akane, Galaxy, Red Elstar, Regal Prince | 3 |
| | | | purple red | Red Jonaprince, Spartan | 4 | |
| | | | brown red | Fiesta, Joburn, Lord Burghley | 5 | |
| 38. | 38. | Fruit: intensity of over colour | light | | 3 | |
| | (*) | | medium | <i>see explanation</i> | 5 | |
| | (+) | | (+) | dark | | 7 |
| QN | QN | | | | | |
| 39. | 39. | Fruit: pattern of over colour | only solid flush | Red Jonaprince, Richared Delicious | 1 | |
| | (*) | | solid flush with weakly defined stripes | Obrogala | 2 | |
| | PQ | | PQ | solid flush with strongly defined stripes | Jonagored | 3 |
| | | | | weakly defined flush with strongly defined stripes | Gravensteiner | 4 |
| | | | | only stripes (no flush) | Helios | 5 |
| | | | | flushed and mottled | Elstar | 6 |
| | | | | flushed, striped and mottled | Jonagold | 7 |

| CPVO N° | UPOV N° | Characteristics | | Examples | Note |
|------------|-----------------|--|-----------------|------------------------------------|------|
| 40. | 40. (* QN | Fruit: width of stripes | narrow | Eden, Pinova, Pirella | 3 |
| | | | medium | Rubinola, Tenroy | 5 |
| | | | broad | Baigent, Caudle | 7 |
| 41. | 41. (* QN | Fruit: area of russet around stalk attachment | absent or small | Elstar, Granny Smith, Piros | 1 |
| | | | medium | Alkmene | 2 |
| | | | large | Egremont Russet, Kaiser Wilhelm | 3 |
| 42. | 42. QN | Fruit: area of russet on cheeks | absent or small | Golden Noble | 1 |
| | | | medium | Karmijn de Sonnaville | 2 |
| | | | large | Egremont Russet, Zabergäu Reinette | 3 |
| 43. | 43. (* QN | Fruit: area of russet around eye basin | absent or small | Golden Noble | 1 |
| | | | medium | Cox's Orange Pippin | 2 |
| | | | large | Arlet | 3 |
| 44. | 44. QN | Fruit: number of lenticels | few | James Grieve | 3 |
| | | | medium | Golden Delicious | 5 |
| | | | many | Granny Smith | 7 |
| 45. | 45. QN | Fruit: size of lenticels | small | Idared, Jonathan | 3 |
| | | | medium | Elstar | 5 |
| | | | large | Florina, Reine des Reinettes | 7 |
| 46. | 46. (* QN | Fruit: length of stalk | very short | Egremont Russet | 1 |
| | | | short | Cox's Orange Pippin | 3 |
| | | | medium | Worcester Pearmain | 5 |
| | | | long | Richard Delicious | 7 |
| | | | very long | Pinova, Rewena, Sirprize | 9 |
| 47. | 47. (* QN | Fruit: thickness of stalk | thin | Golden Delicious | 3 |
| | | | medium | Cox's Orange Pippin | 5 |
| | | | thick | Schone van Boskoop | 7 |

| CPVO N° | UPOV N° | Characteristics | | Examples | Note |
|------------|--------------------------|------------------------------|-----------|---------------------------------|------|
| 48. | 48. (* (+) | Fruit: depth of stalk cavity | shallow | Edward VII | 3 |
| | | | medium | Golden Delicious | 5 |
| | | | deep | Jonagold, Schone van Boskoop | 7 |
| 49. | 49. (* (+) | Fruit: width of stalk cavity | narrow | Beauty of Bath, Gala | 3 |
| | | | medium | Golden Delicious | 5 |
| | | | broad | Jonagold | 7 |
| 50. | 50. (* (+) | Fruit: depth of eye basin | shallow | Worcester Pearmain | 3 |
| | | | medium | Golden Delicious | 5 |
| | | | deep | Bramley's Seedling, Delcorf | 7 |
| 51. | 51. (* (+) | Fruit: width of eye basin | narrow | Pinova, Worcester Pearmain | 3 |
| | | | medium | Golden Delicious | 5 |
| | | | broad | Bramley's Seedling | 7 |
| 52. | 52. (* (+) | Fruit: firmness of flesh | very soft | Astrachan | 1 |
| | | | soft | Jonagold | 3 |
| | | | medium | Cox's Orange Pippin | 5 |
| | | | firm | Kent | 7 |
| | | | very firm | Pilot, Scifresh | 9 |
| 53. | 53. (* PQ | Fruit: colour of flesh | white | Akane, Spartan | 1 |
| | | | cream | Jonagold | 2 |
| | | | yellowish | Delorina, Topaz | 3 |
| | | | greenish | Gloster, Granny Smith | 4 |
| | | | pinkish | Pomfit | 5 |
| | | | reddish | Weirouge | 6 |

| CPVO N° | UPOV N° | Characteristics | | Examples | Note |
|------------|----------------------|---|-------------------------|--|------|
| 54. | 54. (* (+) | Fruit: aperture of locules (in transverse section) | closed or slightly open | Idared, Worcester Pearmain | 1 |
| | | | moderately open | Reine de Reinettes, Šampion | 2 |
| | | | fully open | McIntosh | 3 |
| 55. | 55. (* (+) | Time of beginning of flowering | very early | Anna, Ein-Shemer | 1 |
| | | | early | Idared, Schone van Booskoop | 3 |
| | | | medium | Cox's Orange Pippin, Jonagold | 5 |
| | | | late | Court Pendu Plat, Rall's Janet | 7 |
| | | | very late | Feuilmorte, Spätblühender Taffetapfel | 9 |
| 56. | 56. (+) | Time for harvest | very early | Vista Bella | 1 |
| | | | early | Discovery, Jersey mac, Sunrise | 3 |
| | | | medium | Cox's Orange Pippin, Elstar, Gala | 5 |
| | | | late | Jonagold | 7 |
| | | | very late | Granny Smith, Cripps Pink, Fuji | 9 |

| CPVO N° | UPOV N° | Characteristics | | Examples | Note |
|------------|-------------|--------------------------------|---------------------|--|------|
| 57. | 57. (*) | Time of eating maturity | very early | Vista Bella | 1 |
| (+) | (+) | | very early to early | White Transparent | 2 |
| QN | QN | | early | Discovery, Jersey mac, Mountain Cove, Sunrise | 3 |
| | | | early to medium | Akane, James Grieve, Summerred | 4 |
| | | | medium | Elstar, Gala, Honeycrisp | 5 |
| | | | medium to late | Ambrosia, Spartan, Šampion | 6 |
| | | | late | Golden Delicious | 7 |
| | | | late to very late | Fuji | 8 |
| | | | very late | Cripps Pink, Granny Smith | 9 |

EXPLANATIONS AND METHODS

Ad. 1 : Tree: vigour

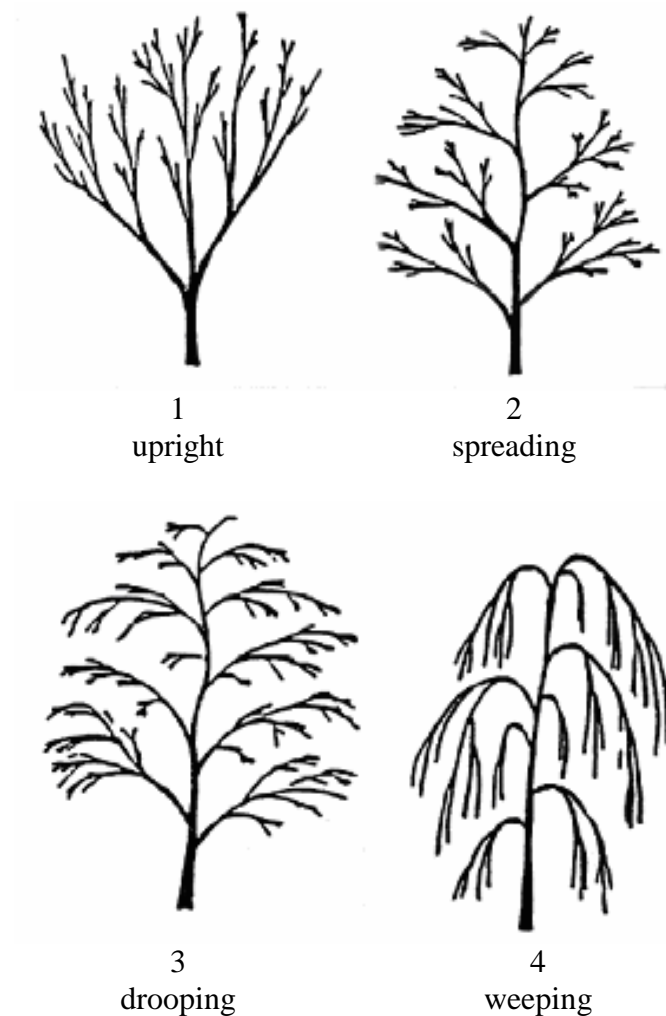
Observation of the tree vigour should be made in summer when the tree is in peak vegetative growth.

Ad. 2 : Tree: type

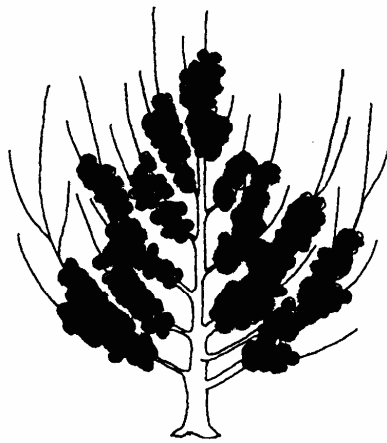
Columnar: a compact spur-type tree form with virtually no side branches. Closely spaced short fruiting spurs are produced along the main stem.

Ramified: form where trees have well developed branches.

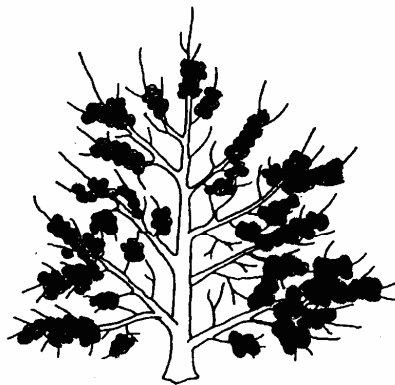
Ad. 3 : Only varieties with ramified tree type: Tree: habit



Ad. 4 : Tree: type of bearing



1
on spurs only



2
on spurs and long shoots



3
on long shoots only

Ad. 5 : One-year-old shoot: thickness

The diameter of the dormant one-year-old shoots should be observed in the centre of the middle internode with a Vernier calliper gauge.

Ad. 6 : One-year-old-shoot : length of internode

The length of internode of the dormant one-year-old shoot should be observed in the middle third of the one-year-old vegetative shoot.

Ad. 10 : Leaf blade: attitude in relation to shoot



1
upwards



2
outwards



3
downwards

Ad. 15 : Leaf blade: incisions of margin (upper half)

The predominant type of incision should be observed.



1
crenate



2
bicrenate



3
serrate type 1



4
serrate type 2

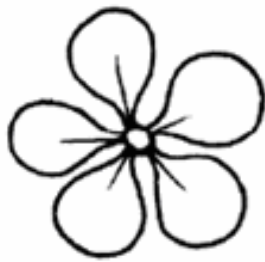


5
biserrate

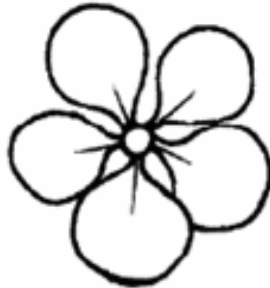
Ad. 19 : Flower: predominant colour at balloon stage

'Balloon stage' is the phenological stage in the course of flower development when the calyx is fully expanded and the petals are recognizable, having partially expanded and inflated but are closed, covering the internal flower organs. Balloon stage is usually 1-2 days before the petals unfold.

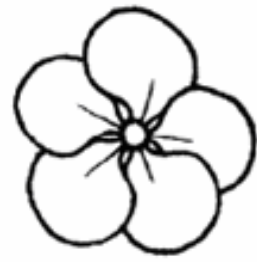
Ad. 21 : Flower: arrangement of petals



1
free



2
intermediate

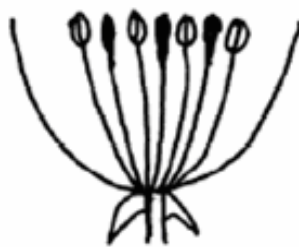


3
overlapping

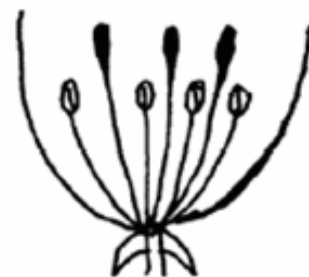
Ad. 22 : Flower: position of stigmas relative to anthers



1
below



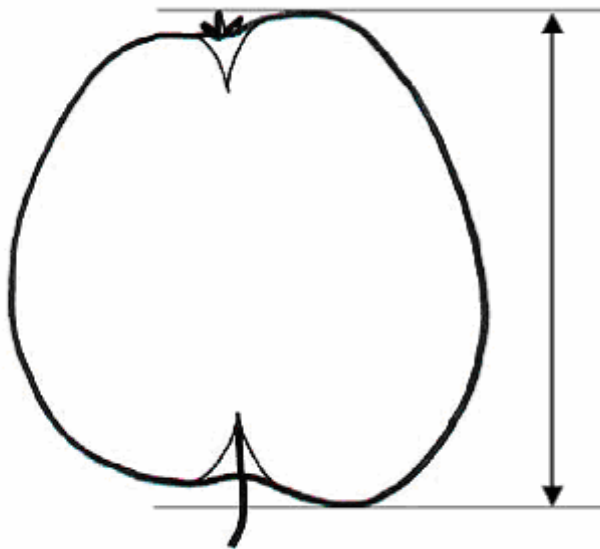
2
same level



3
above

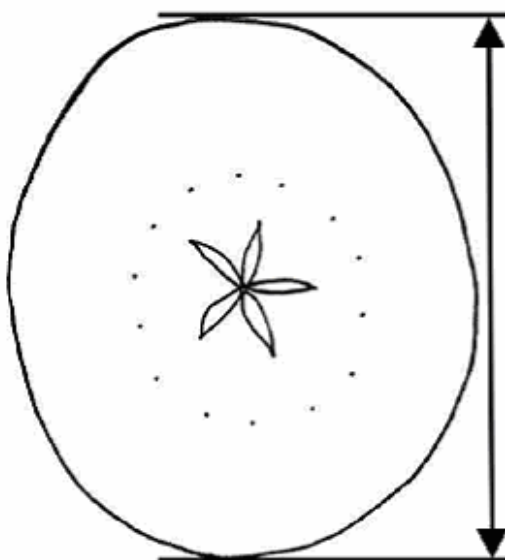
Ad 25 : Fruit: height

The maximum height should be observed.

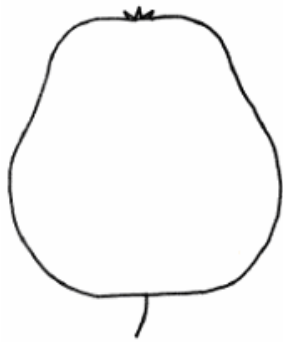


Ad 26 : Fruit: diameter

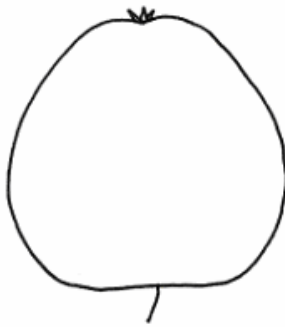
The maximum diameter should be observed.



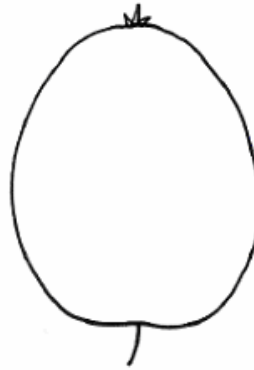
Ad. 28 : Fruit: general shape



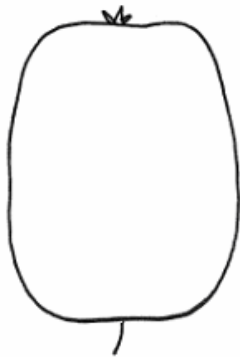
1
cylindrical waisted



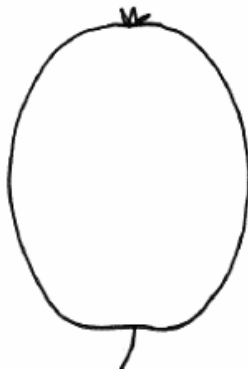
2
conic



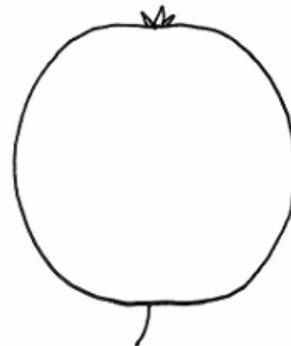
3
ovoid



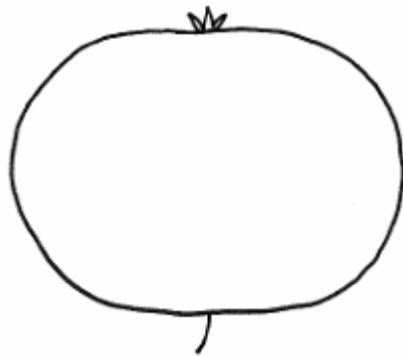
4
cylindrical



5
ellipsoid



6
globose



7
obloid

Additional example varieties with conic shape (state 2):

| | | Fruit: ratio height/diameter (char. 27) | | | | |
|-------------------------------------|--------|---|------------------------|----------------------|--------|-------------------------------------|
| | | very small | small | medium | large | very large |
| Fruit: maximum height (char. 25) | short | Regia | Cox's Orange Pippin | | | |
| | medium | | Melodie | Kidd's Orange Red | Pinova | |
| | tall | | | Jonagold | | Kent, Adam's Pearmain, Saturn |

Additional example varieties with obloid shape (state 7):

| | | Fruit: ration height/diameter (char. 27) | |
|-------------------------------------|------------|--|--------------------|
| | | very small | small |
| Fruit: maximum height (char. 25) | very short | Court Pendu Plat | |
| | short | Discovery | |
| | medium | | Idared |
| | tall | | Bramley's Seedling |
| | | | |

Ad. 38 : Fruit: intensity of overcolour

| | | Fruit: intensity of over colour (char. 38) | | |
|---|------------|--|--|--|
| | | light | medium | dark |
| Fruit: hue of overcolour – with bloom removed (char. 43) | orange red | Egremont Russet, Scigold, Sirprize | Cox's Orange Pippin, Reine des Reinette | |
| | pink red | Lady Williams | Cripps Pink | Delorgue |
| | red | Winter Banana | Gala | Akane, Galaxy, Red Elstar, Regal Prince |
| | purple red | | | Red Jonaprince, Spartan |
| | brown red | Sturmer Pippin | Fiesta | Joburn, Lord Burgley |
| | | | | |

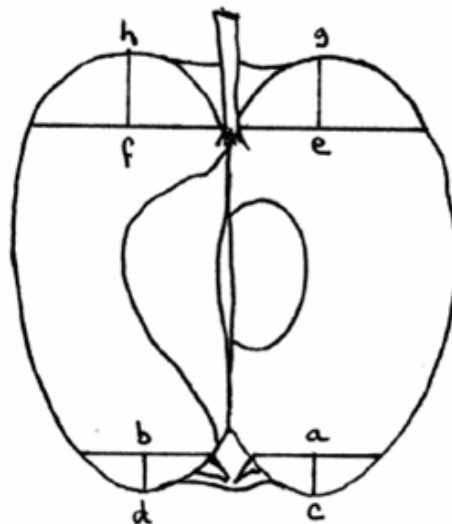
Ad. 48, 49, 50, 51 : Fruit: depth and width of stalk cavity, depth and width of eye basin

Fruits should be cut through the central axis as accurately as possible. Stalk cavity and eye basin depth and width should be measured from the sectioned fruits. The following diagram indicated the position of lines scored, using a knife or scalpel, on the fruit prior to measuring these characteristics.

- The lines a-b and e-f should be at right angles to the axis of the fruit. (A plastic protractor can be used to ensure accuracy).
- The line a-b is marked at the base of the sepals.
- The line e-f is marked at the insertion of the stalk.
- The line a-c and b-d indicate the eye basin depth. They are drawn at right angles to the line a-b to the point where the basin curve levels out.
- The line e-g and f-h indicate the stalk cavity depth. They are drawn at right angles to the line e-f to the point where the stalk cavity curve levels out.
- In the case of asymmetric or irregular sections, the larger side should be considered.

f-h = depth of stalk
cavity (characteristic 48)

e-f = width of stalk cavity
(characteristic 49)



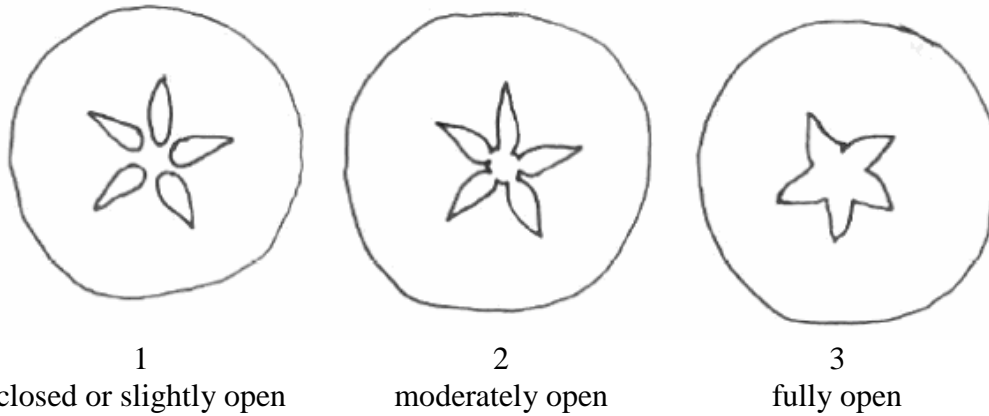
a-b = width of eye basin
(characteristic 50)

a-c = depth of eye basin
(characteristic 51)

Ad. 52 : Fruit: firmness of flesh

Firmness of flesh should be assessed at time of ripeness for eating. It can be measured using a penetrometer.

Ad 54 : Fruit: aperture of locules (in transverse section)



Ad 55 : Time of beginning of flowering

Time of beginning of flowering is when 10% of the flowers are fully open.

Ad 56 : Time for harvest

Time for harvest is the optimum time of picking to achieve fruit in peak condition for eating (see Ad. 57).

Ad 57 : Time of eating maturity

Time of eating maturity is the period when a fruit has reached optimum colour, firmness, texture, aroma and flavour for consumption. Depending on the type of fruit, this period can occur directly after removal from the tree (e.g. early varieties) or after a period of storage or conditioning (e.g. later varieties).

8.3 *Other names of example varieties*

| Example varieties | Synonyms |
|---------------------|--|
| Auralia | Tumanga |
| Cox's Orange Pippin | Cox Orangenrenette |
| Gloster | Gloster 69 |
| Golden Delicious | Gelber Köstlicher |
| Golden Noble | Gelber Edelapfel |
| Gravensteiner | Graasten |
| Nouvelle Europe | New Europe |
| Red Jonaprince | Jonaprince; Red Prince |
| Regal Prince | Prince Gala |
| Reine des Reinettes | Goldparmäne; Plassart; Wintergoldparmäne |
| Šampion | Shampion |
| Schone van Boskoop | Belle de Boskoop; Schöner aus Boskoop |
| White Transparent | Papirovka ; Transparente Jaune; Weißer Klarapfel |

LITERATURE

- Aeppli, A., Gremminger, U., Rapillard, Ch., Röthlisberger, K., 1983: "100 Obstsorten", Verlag Landwirtschaftliche Lehrmittelzentrale Zollikofen, CH, (249 pp.)
- Aomori-ken, 1977: "The report on the characterization and classification of apple varieties", Aomori-ken (By the consignment of the MAFF), JP, (229 pp.)
- Baldini, E., Sansavini, S., 1967: "Monografia delle principale cultivar di Melo", Istituto di coltivazioni arboree dell'Università di Bologna, IT, (302 pp.)
- Bergamini, A., Faedi, W. 1983 and 1985: "Monografia di cultivar di melo", Volumes I + II, Ministero Agricoltura e Foreste, Roma, IT, (122 pp.)
- Brozik, S., Regius J., 1957: "Termeszett gyumolcsfajtáink Almastermesűek. Alma Fruit varieties Apple", Mezogazdasági Kiadó, Budapest, HU, (25 pp.)
- Bultitude, J., 1983: "A Guide to the Identification of International Varieties", Macmillan Reference Books, Macmillan Press, London, GB, (323 pp.)
- Dvorak, A., et al., 1956: "Jablka (Apple)", Academia Praha, CZ, (588 pp.)
- Fischer, M., 1995: "Farbatlas Obstsorten," Eugen Ulmer Verlag, Stuttgart, DE
- FK Obstsorten, 1984: "Sortenbewertung für den Schweizerischen Tafelapfelbau," Schweiz. Zeitschrift für Obst- und Weinbau, CH, 120(93) (20 pp.)
- Kessler, H., 1948: "Apfelsorten der Schweiz", Verlag Verbandsdruckerei AG Bern, CH, (130 pp.)
- Krümmel, H., Groh W., Friedrich, G., 1956: "Deutsche Obstsorten", Deutscher Bauernverlag, Berlin, DE
- Maurer, K.J., 1955: "Apfelsortenkunde in der Baumschule," Verlag M.H. Scharper, DE, (ca. 50 pp.)
- National Fruit Trials, Faversham, GB; "Index of Apple National Fruit Trials"
- Petzold, H., 1978: "Apfelsorten", Verlag Neumann, Leipzig, Radebeul, DE, (224 pp.)
- Sansavini, S., Rosati, P., Faedi, W., 1976: "Le mele Golden Simili" indagine monografica. C.N.R., Bologna, IT, (116 pp.)
- Silbereisen, R., 1980: "Apfelsorten" 2nd. ed., Verlag Eugen Ulmer, Stuttgart, DE, (109 pp.)
- Smith, Muriel W.G., 1971: "National Apple Register of the United Kingdom," Ministry of Agriculture, Fisheries & Food, London, GB, (651 pp.)
- Taylor, H.V., 1946: "The Apples of England," Crosby Lockwood and Sons Ltd, London, GB, (149 pp.)

Weiland, G., 1983: "Aktuelle Literaturinformationen aus dem Obstbau" TU Berlin.
Veröffentlichungen über neuere Apfelsorten No. 113, Universitätsbibliothek der Technischen
Universität, Berlin, DE, (69 pp.)

Wye College, 1993: "Catalogue of Cultivars in the National Fruit Collection", GB

ANNEX II

The Technical Questionnaire is available on the CPVO website under the following reference:
CPVO-TQ/014/2