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**ESTABLISHMENT OF TABLES OF CHARACTERISTICS
IN UPOV TEST GUIDELINES
HARMONIZATION OF CHARACTERISTICS AND STATES OF EXPRESSION**

*Draft for document TGP/7
Revision of document TC/35/8 prepared by the Office of UPOV
in cooperation with experts from South Africa and from
the United Kingdom*

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1. INTRODUCTION

1. In order to provide a harmonized basis for establishing future UPOV Test Guidelines, all the different types of characteristics listed in the existing Test Guidelines have been grouped into three main categories (truly qualitative characteristics, quantitative characteristics and pseudo-qualitative characteristics).

2. In order to enable varieties to be tested and a variety description to be established, characteristics in the UPOV Test Guidelines are subdivided into their different states of expression, or “states” for short, and the wording of each state is followed by a Note (number). Rules have been formulated for handling the states of expression as well as their accompanying Notes.

3. Truly qualitative characteristics are those that show discrete discontinuous states with no arbitrary limit on their number (for instance, number of whorls: one (1), two (2), three (3)). These are qualitative characteristics with clear-cut (discrete) discontinuous states of expression, each state being self-explanatory and independently meaningful. Each state is clearly different from the others and as a rule the characteristics are less susceptible to environment.

4. Quantitative characteristics are those that can be recorded on a one-dimensional scale and show continuous variation from one extreme to the other. They are divided into a number of states of expression for the purpose of description. The division is made only for description and not for distinctness purposes. The Test Guidelines do not specify the difference needed for distinctness. The states of expression should, however, be meaningful for DUS assessment.

5. Pseudo-qualitative characteristics are characteristics that do not fit the definition of truly qualitative characteristics, but are treated as qualitative when it is more reasonable to disregard continuous variation for practical purposes and the states created are meaningful and sufficiently different from each other. This last mentioned group covers the majority of the characteristics used.

6. When deciding on characteristics and their states of expression to be used for plant variety testing, it is, however, important always to first observe the plant, note down the most appropriate wording, compare the wording with examples under the different categories, and to then decide whether it fitted or whether a different wording should be chosen. Throughout the process, the applicability of the wording to the particular situation in the given plant group should be ensured. Although Test Guidelines are prepared to fit specific genera or species and not the other way round, it is useful to have some harmonized principles to ensure that similar characteristics are treated in a similar fashion.

2. GENERAL RULES

2.1 Rules for the Inclusion of Characteristics

2.1.1 Selection of Characteristics

7. In the UPOV Test Guidelines, the characteristics listed are those considered important for the description of varieties and therefore also for the assessment of DUS. Such characteristics may be morphological, physiological, biochemical or of another nature, but they must meet the criteria set out below. The Tables of Characteristics of the individual Test Guidelines are, however, not exhaustive and may be expanded at national level with further characteristics if that proves to be useful and the characteristics meet the conditions set out below.

8. Under the UPOV system, characteristics are selected from the point of view of suitability for description and for DUS testing and not for their commercial value. The superiority or usefulness of a variety is not a criterion for protection, since the economic value of its so-called performance characteristics may change from time to time and from country to country. In certain ornamental varieties it would be almost impossible to assess value, which is a matter of personal preference. It is for the users of the variety, not for the testing authorities, to decide on its superiority or usefulness.

9. Characteristics of commercial value, such as yield, are in many cases largely affected by environment. This is why, in the presence of sufficient other characteristics, UPOV tries to avoid including such characteristics in the Test Guidelines. If however a characteristic of commercial value fulfills all the requirements mentioned below, it can also be used for the assessment of distinctness.

10. The basic requirements that a characteristic has to fulfill before it can be included in the UPOV Test Guidelines or used for DUS testing are the following:

- (a) it must be capable of precise definition;
- (b) it must produce consistent and repeatable results for existing varieties;
- (c) it must allow uniformity requirements to be fulfilled;
- (d) it must be clearly defined in the observation and evaluation of the results;
- (e) for inclusion in the Test Guidelines it must allow a clear differentiation to be made in the collection of varieties of the species concerned;
- (f) it must not lead to easy plagiaristic practices.

11. Although some degree of fluctuation in the expression of genetically controlled differences is expected under different environmental circumstances, priority is given to those inherited characteristics that are least susceptible to environmental influences. Precisely defined testing procedures are also important in minimizing the influence of environmental conditions. In testing one has to be careful to ensure that expressions of characteristics are not

due to factors such as mineral deficiency, or plant health or other external factors. Rootstocks may also have an effect, and certain expressions of vegetatively propagated varieties occurring during the youth phase of a tree may disappear with age.

12. Characteristics based on the response to living organisms (e.g. disease resistance characteristics), chemicals (e.g. herbicide resistance characteristics), as well as characteristics based on chemical constituents may be included, provided that they can be precisely tested and are necessary for establishing distinctness. It is important for each of those characteristics to be well defined, for an accepted, standardized method to be established for evaluation and for that method to be clearly referred to in a well known publication or to be included in the Test Guidelines.

13. Different levels of resistance are only acceptable as a characteristic for establishing distinctness if the states of expression can be clearly separated and the test results are consistent and technically reliable on the basis of a ring test made beforehand between member States. A characteristic can only be used to distinguish a pair of varieties if both the candidate variety and the closest variety are uniform in that characteristic.

14. Where a characteristic normally observed in a bulk sample is the only distinguishing characteristic, one bulk sample alone is not sufficient, and uniformity has to be checked first in the candidate variety and then in the closest variety to ensure that the characteristic can be used for distinguishing that variety pair.

2.1.2 Categorization of Characteristics

15. The UPOV categories of characteristics for use in DUS testing are

- (a) grouping characteristics,
- (b) asterisked characteristics,
- (c) standard characteristics,
- (d) standard characteristics not included in the UPOV Test Guidelines,
- (e) supporting evidence characteristics.

2.1.2.1 *Grouping Characteristics*

16. These are characteristics that can be universally used for grouping varieties. They are such that the level of expression laid down in written states of expression (as in a variety description) will be sufficient for distinctness to be reliably established, and must be sufficiently independent of environmental influences in all regions for that reason. Such characteristics will normally be asterisked characteristics (see below) and should be included in the UPOV Technical Questionnaire.

17. In growing tests groups are formed in such a way that normally a candidate variety will only be compared to varieties in its group. All varieties similar to the candidate must thus be in that group while all varieties obviously sufficiently distinct will be placed in different groups. While in most agricultural species the groups are actually formed in the growing trials, in fruit tree species the groups may only appear on paper or in the head of the technical expert, as obviously trees cannot be rearranged annually according to new candidate varieties.

18. In certain cases well established and internationally accepted classification systems (e.g. the Horticultural Classification of Lilies for Registration or the Classification of Roses According to Flower Color Groups) which are not characteristics at all may also be used for grouping.

19. In cases where the Test Guidelines cover several botanical groups, the first grouping is frequently done according to the botanical groups, which are also not characteristics.

20. At national level, some additional grouping characteristics may be used that do not have an asterisk in the UPOV Test Guidelines. This applies for example to characteristics that may not be observable in certain countries but are excellent grouping characteristics in countries where they can be observed.

2.1.2.2 *Asterisked Characteristics*

21. These are characteristics that UPOV considers important for the testing of DUS and has agreed should be used as a matter of routine for all varieties in every growing period during which the examinations are made; they should always be included in the variety descriptions, except when the state of expression of a preceding characteristic or regional environmental conditions render this impossible. They are marked with an asterisk (*) in the UPOV Test Guidelines.

22. The fact that a given characteristic has an asterisk does not necessarily mean that it is more important or better for DUS testing than one without an asterisk or even one not included in the UPOV Test Guidelines, as long as it fulfills the normal criteria for use in DUS testing. The asterisk merely establishes a common base of routine characteristics to facilitate the cross-border comparison of variety descriptions.

23. A characteristic should only receive an asterisk if it meets all the following criteria:

- (a) it is important for description;
- (b) it is needed as a minimum information for the exchange of information on the variety;
- (c) if all experts agree to the asterisk (if one State objects to the indication of an asterisk to a given characteristic and states the reasons (e.g. no discriminating power under his country's conditions), no asterisk should be given);
- (d) at least the range of example varieties remains the same in the different countries in case the expressions change from country to country;

(e) for a pest or disease resistance characteristic that it must have only the states “absent, present,” (characteristics with degrees of resistance should not receive an asterisk).

2.1.2.3 *Standard Characteristics Without an Asterisk*

24. These are characteristics that UPOV considers appropriate for the testing of DUS but which have not been considered necessary by all member States. They are therefore included in the UPOV Test Guidelines without an asterisk.

2.1.2.4 *Standard Characteristics Not Included in the UPOV Test Guidelines*

25. These characteristics are suitable for the testing of DUS but are only important in one or a few States, or are needed only very rarely for distinctness. They are not included in the UPOV Test Guidelines.

2.1.2.5 *Supporting Evidence Characteristics*

26. These are characteristics that UPOV does not consider sufficient on their own to establish distinctness, but which may provide supporting evidence for other differences which then are used for distinctness. They are not included in the UPOV Test Guidelines, but some, if they meet certain requirements, are included in an Annex to the Test Guidelines, with an express mention that they do not form part of the actual Test Guidelines.

27. Such supporting evidence characteristics should only be used as a complement to other differences in morphological or physiological characteristics. UPOV confirms that the characteristics are considered useful but not sufficient on their own to establish distinctness. They should be used not as a routine characteristic but only at the request or with the agreement of the applicant of the candidate variety and if a test procedure has been agreed upon between the competent authorities.

28. In the case of electrophoresis supporting evidence characteristics some additional criteria are that there has to be a good knowledge of the genetic background, a standardized method and a positive result in a ring test of the method between member States.

29. To avoid plagiaristic approaches, in varieties of cross-fertilized species electrophoresis characteristics should not be used as supporting evidence.

30. Some of these supporting characteristics may be very useful in identifying plant material as belonging or not belonging to a variety that by other means has already proved to be an independent variety.

2.2 Presentation of Characteristics and Linguistic Matters

31. For the presentation of characteristics in the experience gained over the years the following rules have been developed:

32. Wording of characteristics: The wording of the characteristics should be made in a precise and self-contained way to be understood without the knowledge of the states. The states should also be worded in a way to be easily understood without the full text of the characteristic, irrespective of whether it would sound a little strange from a purely linguistic point of view, as long as the experts consider it helpful for the understanding of the characteristic. Therefore, the word “presence of” or “intensity of” may be added, even if the first state would read “absent” (if it was felt necessary to avoid confusion) or “absent or very weak” as long as without the addition it was not clear whether only the absence was of importance or other criteria as number, size, length, width, density, color, etc.

33. Abbreviations: In the Test Guidelines abbreviations should be avoided.

34. Consistency: In one document or in one group of documents there has to be consistency in the use of certain terms. The use of synonyms may lead to misunderstanding, e.g. “ramification” versus “branching” etc. (could be misunderstood to mean different things).

35. Heading of a characteristic: A characteristic normally starts by mentioning the plant or, alternately, the plant part (organ) concerned, followed, after a colon, by the organ or, alternatively, the suborgan or the specialty to be observed (e.g. “Plant: number of flowers” or “Flower: width of petal” or “Petal: color of margin.” The underlined example is used very frequently. The heading of a characteristic should be made precisely and, if possible, self-contained to be understood and clear without the knowledge of the states. The states should also be made more easily understood without the full text of the characteristic, irrespective of whether it would sound a little strange from a purely linguistic point of view, as long as the experts consider it helpful for the understanding of the characteristic. Therefore, if it was felt necessary to avoid confusion, the word “presence of” or “intensity of” could be added, even if the first state would read “absent” or “absent or very weak” as long as without the addition it was not clear whether only the absence was of importance or other criteria as number, size, length, width, density, color, etc.

36. Hyphen (-): In the English wording there should be no hyphen for the connection of the words (narrow acute, yellowish green, greenish yellow, etc.). In English yellow - green with a space before and after the hyphen would mean yellow to green while yellow-green without spaces would mean yellowish green. This differentiation cannot be made in other languages and thus should not be applied to avoid confusion for translations.

37. Intensity: For characteristics on color intensity, no example varieties should be indicated except if only one color (e.g. green) is mentioned. Example varieties for the intensity could be given in the explanations for each color separately.

38. Numbers: Numbers lower than 10 should be spelled out. Higher numbers should be indicated numerically.

39. The order of characteristics should be as follows:

- (a) Botanical order: The characteristics in the Table of Characteristics should follow the botanical order as follows: grain (seed submitted), seedling, plant (e.g. growth habit), root, root system or other subterranean organs, stem, leaf (blade, petiole, stipule), inflorescence, flower (calyx, sepal, corolla, petal, stamen, pistil), fruit, grain (harvested). That order should, however, be applied with some flexibility. If considered useful by the experts, the characteristic of a part of a higher organ concerning that organ was considered to be more usefully connected with other characteristics of the lower organ, that should be acceptable. Therefore, the characteristic: “Flower; number of petals” could be placed, if so desired, next to other characteristics of the petal and not necessarily next to other flower characteristics or it may even follow the chronological order of recording.
- (b) Order of suborgans inside an organ: The order normally starts with characteristics of the whole organ followed by those of its parts (e.g. base, margin) followed by suborgans starting with the larger parts and followed by smaller parts (e.g. inflorescence, flower, stamen, anther, pollen or starting with the outer/lower parts followed by the inner/higher parts (e.g. inflorescence, calyx, corolla).
- (c) Exceptions: In case the totality of all given suborgans is concerned, which would be in reality a characteristic of the next higher organ (e.g.: Flower: arrangement of petals; flower: number of styles), it would normally be placed before the characteristics of suborgans of the flower. It could, however, remain together with the characteristics of the suborgan concerned (e.g.: “Flower: arrangement of petals” could remain together with the other characteristics on the petal and “Flower; number of styles” could remain together with the other characteristics on the styles).
- (d) Order of type of observation: Within the above order, the following subdivision has been adopted for the characteristics of the plant as a whole or the various organs of plants: attitude, height, length, width, size, shape, color, other details (such as surface, etc., and individual parts of the organ such as base, top and margin).

40. Use of presence: In the past it was recommended that the words “presence of” or “intensity of” should not be used in connection with a state “absent” for the reason that “presence” or “intensity” cannot be absent. Thus instead of “Presence of stipule: absent (1), present (9)” it should be stated: “Stipule: absent (1), present (9).” This position was amended and it is now possible to use the wording: “Intensity of anthocyanin coloration” with the first state: “absent or very weak (1)” instead of “Anthocyanin coloration: absent or very weak (1), weak (3), etc.” The same would apply to “Anther: amount of pollen: absent (1), sparse (2), abundant (3).” Although from a purely linguistic point of view it may be wrong, it is much more helpful for the understanding of the characteristic. It helps to separate the given characteristic from other characteristics of the same organ without having to look at the states of expression. (See also paragraph 33).

41. Repetitions of words inside states: Instead of repeating a word in the states, it has to be used only once after the wording of the heading of the characteristics, e.g. instead of “Leaf

blade: color of upper side: light green (3), medium green (5), dark green (7) it should read "Leaf blade: green color of upper side: light (3), medium (5), dark (7)." (See also paragraph 33).

42. Splitting a characteristic: Splitting into several characteristics should be done as early as possible (e.g. leaf color should be cut down to color and intensity of color), but may not always be useful (e.g. ornamentation of grain cut down to marbling (1/9), flecking (1/9), dotting (1/9)). It would depend on each case and should thus not be obligatory.

43. Underlining: In the case that in two or more characteristics there is only one difference (e.g. upper or lower side of blade) to be observed, the part that differs should be underlined (e.g. "upper side," or "lower side").

2.3 Recommended Terminology

44. The use of the following terminology is recommend:

45. Terms Used to Describe Plant Habit/Attitude

(i) Attitude/Position: “Attitude” or “position” should be used instead of “pose” or “stance.”

(ii) Columnar: Tall, cylindrical or tapering. As a tree habit, it is used specifically to a mutation form in apple varieties in which the branch development is suppressed but the main stem is not.

(iii) Decumbent: Lying along the ground , but with the apex ascending and almost erect.

(iv) Dwarf: A form in which growth is suppressed leading to a plant much below the normal height or size of its species.

(v) Drooping: (of vertical organs) inclining a little at the apex. Bending downwards. (Not as extreme as weeping).

(vi) Erect: Vertical, upright, perpendicular to the ground or point of attachment.

(vii) Fastigate: Strongly erect with a narrow crown. Branches virtually erect and parallel with the main stem.

(viii) Horizontal: (of organs or parts) level, parallel to the ground(horizon).

(ix) Pendant: Hanging.

(x) Prostrate: Lying flat on the ground.

(xi) Ramified: Branched. “Ramification” should be used instead of “branching.”

(xii) Spreading: Extending horizontally outwards.

(xiii) Spur type: A form found in fruit varieties in which the shoot internodes are very short.

(xiv) Upright: Habit in which shoots and branches are held in an upward direction but not addressed to the main stem (fastigate). “Upright” should be used for the whole plant, “erect” for plant parts.

(xv) Weeping: Hanging down – branches long and pendulous.

46. Anthocyanin/Reddish Coloration: The term anthocyanin coloration is used as a generic term for reddish coloration. It is in most cases assumed that reddish coloration is caused by

anthocyanin pigmentation. In some cases, however, red coloration may be a better term, or just “pigmentation.”

47. Apex/Tip: For UPOV purposes the apex is considered to be the whole (larger) apical (highest) part of an organ while the tip is only the small, most apical (extreme) part. The term “apex” should be used where the organ becomes about 25% narrower than the broadest part and the term “tip” only for the very extreme, after it has become concave. Using this definition it is possible for a leaf tip to be “absent” i.e. when the most apical part of a leaf is rounded. It is also possible for the apex to be rounded but for there to be a pointed tip. In Test Guidelines it is usual to include the qualifier “excluding tip” in the apex of the leaf shape characteristics. “Top” should only be used for the highest part with relation to soil level.

48. Central/Middle: “Central” should be used for the center of a circle (it is pinpointed) while “middle” for the middle area (e.g. middle third of a branch (a range)).

49. Color: It is proposed to use only basic terms and not descriptive ones, e.g. “red” instead of “crimson,” “yellow green” instead of “lime,” etc., unless they have been widely used for certain species and would otherwise lead to misunderstanding (e.g. “cream” for “yellowish white”).

50. Dentation: “Dentate” and “serrate” are often creating doubts. In the case of “dentate” the inner part of the incision is concave.

51. Foliage: The foliage includes branches and does not refer to leaves only. It gives a global impression. According to different dictionaries foliage means all the leaves of a tree or plant.

52. Height: For “height” in the English wording the terms “short → tall” should be used.

53. Length/Width/Size: “Length” and “width” are normally easier to observe, even if the observation is made by visual assessment rather than by measurement. However, “size” may be preferable for very small plant parts, e.g. stipules. Both “length” and “width” should normally not be included together with “size” for the same organ or suborgan in one document. They may, however, be included together with the length/width ratio. There may be special cases where it is preferred to also add “size” in addition to “length” and “width” but these should be kept to real exceptions.

54. Light/Pale: The difference between “pale” and “light” (e.g. pale green, light green) often creates doubts. For most characteristics on the intensity of a given color the terms “light” and “dark” are used.

55. Lower/Upper: At present the following terms are used for similar cases: outer/inner (used e.g. for two sides of a single Chrysanthemum ray floret), lower/upper, adaxial/abaxial, ventral/dorsal).

56. Maximum: When measuring the diameter or width, the maximum dimension is always taken unless otherwise stated. It is therefore superfluous to include the word “maximum.” Only in cases where a plant part has a larger and a smaller diameter, is it recommended to say “maximum diameter” and “minimum diameter.”

57. Oblong: “Oblong” should be used rather than “elongate” when referring to a shape. “Elongate” is not a defined shape.

58. Pubescence: This term is used as a generic term for any type of hair, even though pubescence itself is a specific and described type of fine, soft, short hair.

Remark: In many instances in existing Test Guidelines the type of hair is short and soft and the term pubescence is valid in the strict sense. (e.g.: apple shoot and leaf characteristics). For instances where the hair is not soft and short (as in Kiwifruit) a botanical term for the specific type of hair or the general term “type of hair” or “hairiness” should be used.

59. Quadrangular: “Quadrangular” should be used instead of “square.”

60. Ramification: “Ramification” should be used instead of “branching.”

61. Rigidity: “Rigidity (rigid)” should be used instead of “stiffness (stiff).”

62. Round/Rounded: “Round” should be used for a full shape but “rounded” for a base or apex shape.

63. Use of Shape Characteristics: In shape characteristics there can be two different expressions in one state of expression (e.g. Weeping Fig, characteristic 19: narrow elliptic (1), elliptic (2), broad elliptic or broad ovate (3), ovate (4)), but also cases exist when there could be the whole range between two states of expression (e.g. Stative, characteristic 5: elliptic (1), broad ovate to deltoid (2), narrow obovate (3), obovate (4)). The use of the word “to” is therefore also acceptable in shape characteristics. (See also one-dimensional characteristics above). When plant shapes, angles and attitudes are described in precise terms such as circular, triangular, right-angled, horizontal, etc., it is to be understood as the approximate situation and not actual mathematical precision. It is therefore not necessary to include the word “approximately”, as in e.g. “approximately right-angled.”

64. Terminology to be Used in Plane Shape and Solid Shape Characteristics: In order to harmonize the shape characteristics, the Office of UPOV agreed on the following:

- For shapes in the first instance the diagrams and technical terms as proposed by the “Royal Horticultural Society (RHS)” should be used in the preparation of UPOV Test Guidelines.
- In case the solution proposed by the RHS is not satisfactory, it is recommended to use for plane shapes the diagrams proposed by “Hickey” and for solid shapes the diagrams proposed by “Radford.”

The above mentioned diagrams and technical terms can be found in the following publications:

RHS: The New Royal Horticultural Society Dictionary of Gardening, 1992, Macmillan Press Ltd., London

Hickey: Hickey, L. J., 1973: Architecture of Dicotyledonous Leaves: American Journal of Botany 60: 17-33

Radford: Radford et al., 1974: Vascular Plant Systematics, Harper and Row Publishers Inc., New York, or

Hortus Third, 1976: L. H. Bailey Hortorium, Cornell University, Macmillan Publishing Company New York, or

Stearn, W. T., 1992: Botanical Latin, Fourth edition, David and Charles Publishers, Newton Abbot, United Kingdom

Some examples from the above three proposals (RHS, Hickey, Radford) are given in document TWF/29/3. A glossary of most common terms is added to this document.

65. General Rules for Describing Shapes and Forms And Comments

(i) In describing shape and form, the terms used should be appropriate. (“Flat” is not a shape!)

(ii) Characteristics that are essentially two-dimensional (leaves, petals) or solid forms viewed in a single perspective such as “in profile” should be described in terms for **plane** shapes.

(iii) Characteristics of general shape of a three-dimensional feature such as a seed, stone or fruit should be described with terms for **solid** shapes.

(iv) The base of an organ is the end nearest to the point of attachment.

(v) Simple plane and solid shapes are divided into mathematically determined groups with regard to their length/width ratios and they should be indicated accordingly. The terms “elliptic” and “broad elliptic” each have specific dimensions and are mutually exclusive. They form part of the following full range: narrow elliptic (ellipsoid), elliptic, broad elliptic, round (globose / spheroid), narrow oblate (obloid), oblate, broad oblate.

(vi) When plant shapes, angles and attitudes are described in precise terms such as circular, triangular, right-angled, horizontal etc., it is to be understood as the approximate situation and not actual mathematical precision. It is therefore not necessary to include the word “approximately”, as in e.g. “approximately right-angled.”

(vii) If all states of expression of a shape characteristic have the same basic shape (e.g. narrow elliptic, medium elliptic, broad elliptic), the characteristic should not be expressed as a shape (e.g. width: narrow, medium, broad).

(viii) In the case of shape characteristics the order of the states of expression inside a characteristic should as a general rule be from the lesser expression to the higher or larger expression. Shapes of apex should start from pointed to rounded or from raised to depressed expression. More details on the order of states of expression are contained in Chapter 2.4. In

certain characteristics there appears to be a clash between two recommended orders: Ex. Shape of base: pointed (1), rounded (2), flattened (3), depressed (4). In this case the “narrow to broad” should overrule the “low to high.”

(ix) In the past such terms as acuminate, cuspidate and mucronate have been wrongly applied. In the future, all Test Guidelines should be prepared using the terms as described in the recommended text or in the glossary below. For the shape of leaf tip the wording “Leaf: length of tip” with the states “very short (1), short (3), medium (5), long (7), very long (9)” would be more appropriate.

(x) “Shape in cross section” should be used and not “of cross section.”

(xi) When referring to a shape “oblong” should be used rather than “elongate.”

(xii) Quadrangular: “Quadrangular” should be used instead of “square.” “Quadrangular” is, however, defined as being “four angled” but this may not be necessarily “square.” It is only square if all four sides are the same length and all angles are 90 degrees.

(xiii) Round: “Round” should be used for a full (solid) shape but “rounded” for a base, apex or tip shape.

66. Uniform: The term “uniform” is not admitted as a state of expression (e.g. do not use “uniform” for distribution of color, etc). This term is restricted for use with reference to uniformity in DUS and all varieties have to be uniform. The same applies to “distinct” for a color that is clear, etc.

67. Upright/Erect: “Upright” should be used for the whole plant (e.g. growth habit of plant), “erect” for plant parts (e.g. attitude of branches).

68. Weight: “Weight” should be used instead of “mass,” otherwise it might get confused with “volume.”

2.4 Rules for Establishing States of Expression

69. The following rules for establishing states of expressions should be followed:

70. Absence/Presence: In characteristics with the states “absent, present” “absent” means total absence on all plants, e.g. of asymmetric leaves, “present” means some leaves on a plant are affected, the variation within one plant does not matter. UPOV decided to stick to its original decision with the Notes absent (1) and present (9) to avoid confusion despite the fact that some experts admit that expressions “absent” and “present” would more correctly have been 1 and 2.

71. Number of States: “One and the same characteristic may have different numbers of meaningful states in different species, e.g.:

Attitude: erect (1), semi-erect (2), horizontal (3)
or: erect (1), erect to semi-erect (2), semi-erect (3), semi-erect to horizontal (4), horizontal (5)”

It depends on the variation within varieties and whether it is more reasonable in each particular species to divide the full range into a number of qualitatively expressed states or into the 9 quantitatively expressed states.

72. Combination of Qualitative States: It is not possible to form a single state of expression by combining two truly qualitative states, as by definition there is not transition between qualitative states. Therefore the following combinations are not possible: single colored to bicolored, bicolored to multicolored, flat to convex (e.g. “flat to convex” would include flat and all intensities of convex expression, and therefore would not be a state but a wide range of states of expression).

73. Existence of States of Expression: In case where more than only Notes 3, 5, 7 of a quantitative characteristic are mentioned that does not necessarily mean that the whole range is represented in the reference collection. The mentioning of a state of expression of a quantitative characteristic in the Test Guidelines does not mean that the state really exists in the reference collection. However, the state with Note 1, unless it reads “absent or ...” when it has always to be indicated, or Note 9 is only indicated if an example variety is mentioned.

74. Even Notes in Quantitative Characteristics: All Notes of a quantitative characteristic of the Table of Characteristics should be used, including the even Notes whether or not they are explicitly indicated in the Test Guidelines. The naming of the even Notes must be obvious and clearly formable, otherwise they have to be indicated in the Test Guidelines. They are as important as the uneven Notes for the description of a variety and should be used whenever they are occurring in the variety.

75. Numbers: For numbers lower than 10, the actual numbers are often used. For higher numbers the terms, “few (3), medium (5), many (7)” are used. If actual numbers are used, the states should be mutually exclusive, e.g. smaller than three (1), three to five (2), larger than five (3), unless the following situation occurs: only two (1), only three (2), two and three (3).

76. Intensity: For characteristics on color intensity comprising several colors, no example varieties should be indicated in the Table of Characteristics. Example varieties for the intensity of the individual colors could be given in the explanations for each color separately.

77. Not clearly One-Dimensional Characteristics: Characteristics that are of a quantitative nature but are not clearly one-dimensional are considered pseudo-qualitative characteristics. In these cases a symmetric arrangement of the states around a medium state is not necessary (and often not meaningful). Moreover, there is no obligation to use a 1 to 9 scale (e.g.: “flat (1), slightly concave (2), clearly concave (3)” or “slightly convex (1), flat (2), slightly concave (3), clearly concave (4)” or “in the middle (1), slightly to the base (2), clearly to the base (3), at the base (4)”). In these cases the word “medium” or “intermediate” (e.g. leaf shape: intermediate) should be avoided as a term for a state, as it would be meaningless.

78. One-Dimensional Characteristics: For clearly one-dimensional quantitative characteristics a symmetric arrangement of the states around a medium state is meaningful (e.g. plant length: very short (1), short (3), medium (5), long (7), very long (9); intensity of anthocyanin coloration: weak (3), medium (5), strong (7)). If there is not clear “absence” in any of the varieties, the absent/present characteristic is not justified and the first state of expression should read: “absent or very ...” (e.g. absent or very short, absent or very weak).

79. Order of States of Expression Inside a Characteristic:

- (a) In so far as it is possible to impose an order on the expressions inside a characteristic, the smaller, lesser or lower expressions should be assigned the lower Note. The order of states should as far as possible be:
- from weak to strong
 - from light to dark
 - from low to high
 - from narrow to broad

In the case of shape characteristics of apex or base, the order should be from pointed to rounded or from raised to depressed expression. In case there may appear to be a conflict between two recommended orders, as in Shape of base: pointed (1), rounded (2), flattened (3), depressed (4). In this case the “narrow to broad” should overrule the “low to high.”

Examples

Ex. 1: Growth habit: upright (1), spreading (2), prostrate (3), drooping (4)

Ex. 2: Shape of apex: acute (1), obtuse (2), rounded (3), truncate (4), depressed (5)

Ex. 3: Shape: elliptic (1), circular (2), ovate (3), obovate (4).

- (b) In the case of colors the chronological appearance of the color (e.g. as the fruit ripens) may also be used. The same sequence should be used for organs with similar states within a single document (e.g. color of leaf and color of stem).
- (c) In the case of characteristics with two single alternative expressions and one combined expression, the combined expression is always placed at the end (e.g. only green (1),

only red (2), green and red (3)), unless special reasons justify a different order (e.g. for Grapevine: to avoid an unnecessary deviation from a previous decision by another organization (OIV)).

80. Presentation of Characteristics in a Symmetrical Way: The states of expression for quantitative characteristics had been presented in the past in a symmetrical way. This practice has been abolished and expressions beyond the Notes 3, 5, 7 are only indicated if example varieties are mentioned apart from the case where Note 1 combines absence with a very low expression.

81. Quantitative Attributes in Qualitative Expressions: If several graduations of a qualitative state of expression are used for a characteristic, all these states of expression should be formed by combining the qualitative expression with a quantitative attribute. Therefore it should read: strongly convex–slightly convex–flat (and not strongly convex–convex–flat), straight–slightly recurved–strongly recurved (and not straight–recurved–strongly recurved), much broader than long–slightly broader than long (and not much broader than long, broader than long), light red–medium red–dark red (and not light red–red–dark red). In the case of one-dimensional quantitative characteristics which allow only 3 or 4 states, these states should, if possible, be formed in an alternative way to the usual 1 to 9 scale (e.g. absent or very weakly expressed (1), weakly expressed (2), strongly expressed (3) and not absent or very weak (1), weak (2), strong (3)).

82. Translation of Technical Terms: The Office of UPOV has prepared a list of most common characteristics and states of expression and has translated them into the other UPOV languages in order to help in the preparation of Test Guidelines. The former document TC/33/9 containing these translations is added to this document. The list gives, in the English alphabetical order, keywords of characteristics used, or recommended to be used, in UPOV Guidelines and their possible states of expression. In the case of more than one set of states of expression being given for the same keyword, drafters of new Test Guidelines should choose the most appropriate one.

3. CATEGORIES OF CHARACTERISTICS

83. There are three categories of characteristics:

- (i) truly qualitative characteristics,
- (ii) quantitative characteristics,
- (iii) pseudo-qualitative characteristics.

3.1 Truly Qualitative Characteristics

84. Truly qualitative characteristics are those that show discrete discontinuous states with no arbitrary limit on their number (for instance, number of whorls: one (1), two (2), three (3)). These are qualitative characteristics with clear-cut (discrete) discontinuous states of expression, each state being self-explanatory and independently meaningful. Each state is clearly different from the others and as a rule the characteristics are less susceptible to environment.

85. There are not many true qualitative characteristics. Characteristics expressing fixed numerical ranges also resort under this category, as by the definition of the states they are discrete and discontinuous. Some of the examples listed under category 3.3 may also belong here in individual cases where continuous variation does not occur.

86. The states are given Notes (numbers) starting with one, except in the case of ploidy, where—in order to avoid confusion—the number of chromosome sets is accepted as the Note (e.g. diploid (2), tetraploid (4)).

87. Truly qualitative characteristics are presented by consecutive numbers according to the state, starting with Note 1 and often with no upper limit, for example:

<u>Plant: sex</u>	<u>Note</u>
dioecious female	(1)
dioecious male	(2)
monoecious unisexual	(3)
monoecious hermaphrodite	(4)

88. Further examples are:

- Ex. 1: Color: colorless (1), single colored (2), bicolored (3), multicolored (4)
- Ex. 2: Embryony: monoembryonic (1), polyembryonic (2)
- Ex. 3: Flowering habit: once flowering (1), twice flowering (2), almost continuously flowering (3)
- Ex. 4: Number: only two (1), two and three (2), only three (3), three and four (4), only four (5), two, three and four (6)
- Ex. 5: Ploidy: diploid (2), tetraploid (4), hexaploid (6), octoploid (8)
- Ex. 6: Resistance: not resistant (1), resistant to one or several races (2), resistant to all races (3)
- Ex. 7: Sex of plant: female (1), male (2), hermaphrodite (3)
- Ex. 8: Type of flower: single (1), semi-double (2), double (3)

3.2 Quantitative Characteristics

89. Quantitative characteristics are those that can be recorded on a one-dimensional scale and show continuous variation from one extreme to the other. They are divided into a number of states of expression for the purpose of description. The division is made only for description and not for distinctness purposes. The Test Guidelines do not specify the difference needed for distinctness. The states of expression should, however, be meaningful for DUS assessment. The range is divided into nine states which are normally equally spaced and measurable on a one-dimensional scale.

90. Truly quantitative characteristics express different degrees of only two contrasting basic expressions, arranged symmetrically on either side of an intermediate expression (“medium” state). The scale is flexible towards one or both extreme ends. In some cases none of the states are fixed and the whole scale can expand or shrink or move to the right or left (category 3.2.1). Sometimes only the lower extreme is fixed and the scale is flexible towards the top (category 3.2.2). In other cases only the “medium” state is fixed, from which point the scale is flexible in both directions (category 3.2.3).

91. Some truly quantitative characteristics may be handled as qualitative when it is considered more reasonable to consider only a condensed range instead of the full range of nine states. The continuous variation is disregarded for practical purposes and the states are created to be sufficiently different from one another (category 3.3.5).

92. Indication of States: As a general rule, states are formed in such a way that for the weak and strong expressions a reasonable word pair is chosen, for example:

weak/strong
short/long
small/large

93. These word pairs are given Notes 3 and 7 and the intermediate state Note 5. The remaining states of the scale using Notes 1 to 9 are formed according to the following example:

<u>State</u>	<u>Note</u>
very weak	(1)
very weak to weak	(2)
weak	(3)
weak to medium	(4)
medium	(5)
medium to strong	(6)
strong	(7)
strong to very strong	(8)
very strong	(9)

94. In all cases of quantitative characteristics the full scale 1, 2, 3, 4, 5, 6, 7, 8, 9 is applicable. However, for the practical purposes of presentation, only Notes 3, 5, 7 or 1, 3, 5, 7 or 3, 5, 7, 9 or 1, 3, 5, 7, 9 are given in the Test Guidelines to indicate that the quantitative

scale is applicable. This is done purely for reasons of simplification and in order to save typing work and document space. In all cases, however, it means that the full scale (1 to 9) is applicable.

95. As the whole 1 to 9 scale is always applicable, it makes no difference whether a certain state is mentioned or not. Additional states are only given if additional information on example varieties is needed. The allocation of Note 1 does not require a mention of Note 9 for symmetry or vice versa. Usually the use of Notes 3, 5 and 7 is sufficient to indicate that the whole 1 to 9 scale is applicable.

96. In alternative observations, where there is a clear-cut separation between absence and presence, the state “absent” is given by Note 1 and the state “present” Note 9. If in a characteristic it is necessary to make a distinction between complete absence and different degrees of presence, the characteristic is split into an alternative (qualitative) characteristic with the states “absent (1)” and “present (9)” and a quantitative characteristic with Notes from 1 to 9.

97. For those characteristics where it is not possible to make a clear-cut distinction between “absent” and “very weak,” Note 1 denotes “absent or very weak” and then represents the first state in the 1 to 9 scale for quantitative characteristics.

98. For quantitative characteristics, example varieties should—as far as possible—be given, at least for a few states of expression (e.g. 3, 5, 7).

99. The full range of states is equally spaced along the total scale, with the intermediate (“medium”) state in the middle. The minimum requirement is that states 3, 5, 7 should be indicated in the Test Guidelines but if it is required to list example varieties for one or both extremes, then states 1, 3, 5, 7 or 3, 5, 7, 9 or 1, 3, 5, 7, 9 are to be indicated. Experts very seldom decide to include example varieties for even states as well but in this case the full range of states 1, 2, 3, 4, 5, 6, 7, 8, 9 is listed. For cases where the total of possible differences is small, it is also acceptable to list only a limited section of the full range, such as 4, 5, 6, provided that the symmetry is maintained. This situation does, however, not occur often.

100. Document TC/33/9 containing translations into French, German and Spanish of most frequently used States of Expression and Notes of Characteristics Appearing in UPOV Test Guidelines may also be useful as examples of most frequent cases.

101. Wording of Even States: Even states are seldom indicated in the Test Guidelines. However, when establishing the states of expression, the wording of the even states should always be considered for the sake of variety descriptions. The even states are worded by combining the wording of the preceding and following states by using the word “to.”

102. Indication of the Whole Scale: The whole scale 1, 2, 3, 4, 5, 6, 7, 8, 9 with example varieties should only be indicated if there is no risk of a change in the order of the example varieties under different environmental conditions.

3.2.1 Truly Quantitative Characteristics With No States Fixed

103. Because no states of expression are fixed, the whole scale can expand or shrink and move up or down, depending on each particular situation. None of the states are therefore self-explanatory and independently meaningful. These characteristics are always expressed quantitatively and in general require the indication of example varieties to connect the wording of a state of expression with a given expression.

104. Wording of Uneven States: States 3 and 7 are worded by using only the contrasting basic expressions, e.g. “weak (3)”, “strong (7)”, or “weakly curved (3)”, “strongly curved (7).” States 1 and 9 are worded by adding “very” to the wording of states 3 and 7 consecutively: “very weak (1)” or “very weakly curved (1).” State 5 is normally worded “medium” but may also be “intermediate”, or e.g. “moderately curved.”

105. Examples: There are two groups of examples:

(a) Contrasting basic expressions of states 3 and 7 each indicated by a single word

- Ex. 1: Acidity: low (3), medium (5), high (7)
- Ex. 2: Degree: weak (3), medium (5), strong (7)
- Ex. 3: Diameter: small (3), medium (5), large (7)
- Ex. 4: Texture: fine (3), medium (5), coarse (7)

(b) Contrasting basic expressions of states 3 and 7 each indicated by a phrase

- Ex. 1: Curvature: slightly curved (3), moderately curved (5), strongly curved (7)
- Ex. 2: Curvature: slightly convex (3), medium convex (5), strongly convex (7)

(State 1 of the above example 2 would read: “very slightly convex” and state 2 would read “very slightly convex to slightly convex”).

106. Limited Range: In some cases the full scope of differences is so small that only a limited range of close states can be observed. These states should receive the notes 4, 5, 6 as follows:

Length: short to medium (4), medium (5), medium to long (6)

3.2.2 Truly Quantitative Characteristics With Only The Lower Extreme Fixed

107. This category is for characteristics in which the lower extreme has reached its limit, namely the state “absent” or equivalent wording. Depending on each particular situation, the whole scale may expand or shrink towards the top and the fixed lower extreme is consequently the only self-explanatory and independently meaningful state of expression. These characteristics may be handled in two ways, depending on whether the lower extreme shows a clear “absence” or an unclear “absence.”

108. Handling of Cases With a Clear “Absence”: In cases with a clear “absence”, the characteristic is split into two, the first being a qualitative characteristic reading “absent (1),

present (9).” The second characteristic will be included in cases where it is required to also indicate different degrees of presence. For this second quantitative characteristic, only states 3, 5, 7 are normally listed, reading “weak (3), medium (5), strong (7)” or equivalent wording. The wording should basically correspond with that explained in paragraph 90. An example of a clear “absence” is:

Pubescence : absent (1), present (9) (qualitative characteristic)

and

Intensity of pubescence: weak (3), medium (5), strong (7) (quantitative characteristic)

109. Handling of Cases With an Unclear “Absence”: In cases with an unclear “absence”, all states are contained in a single quantitative characteristic, with state 1 reading “absent or very weak” or equivalent wording. In cases with more complicated wording, the words “or very weak” etc. have sometimes been left out in state 1, in order to simplify the wording. States 3, 5, 7 should always be indicated and, if example varieties are available for state 9, also state 9. The wording should basically correspond with that explained in paragraph 90. Examples of an unclear “absence” are:

(a) *Contrasting basic expressions of states 3 and 7 each indicated by a single word*

Ex. 1: Adherence: absent or very weak (1), weak (3), medium (5), strong (7)

Ex. 2: Difference: none or very slight (1), slight (3), medium (5), marked (7)

Ex. 3: Number: absent or very few (1), few (3), medium (5), many (7), very many (9)

(b) *Contrasting basic expressions of states 3 and 7 each indicated by a phrase*

Ex. 1: Shape in cross section: straight or very weakly concave (1), weakly concave (3), moderately concave (5), strongly concave (7)

Ex. 2: Regularity: even or very slightly uneven (1), slightly uneven (3), moderately uneven (5), strongly uneven (7)

Ex. 3: Size in relation to: same size (1), slightly smaller (3), moderately smaller (5), much smaller (7), very much smaller (9)

3.2.3 Truly Quantitative Characteristics With Only The “Medium” State Fixed

110. In this category the intermediate expression is fixed, whereby it clearly separates the two contrasting basic expressions. These are indicated symmetrically in intensifying degrees on either side of the “medium” state.

111. Wording of Different Degrees of Expression: The different degrees of expression should be worded in such a way that they are mutually exclusive. Since “smaller” also includes “much smaller” in the following example, it is necessary to differentiate between the different degrees of expression, although state(s) 1 and/or 9 are omitted if no example varieties are indicated for these states.

Ex. 1: Not: Size relative to: much smaller (1), smaller (3), same size (5), larger (7), much larger (9)

But: Size relative to: much smaller (1), moderately smaller (3), same size (5), moderately larger (7), much larger (9)

112. In the following example, “acute” also includes “very acute”, since it covers all angles between 0° and 90°:

Ex. 2: Not: Angle: very acute (1), acute (3), right angle (5), obtuse (7), very obtuse (9)

But: Angle: very acute (1), moderately acute (3), right angle (5), moderately obtuse (7), very obtuse (9)

Further examples:

Ex. 3: Attitude (in relation to plant parts): strongly upwards (1), moderately upwards (3), horizontal (outwards) (5), moderately downwards (7), strongly downwards (9)

Ex. 4: Curvature: strongly incurving (1), moderately incurving (3), straight (5), moderately reflexing (7), strongly reflexing (9)

Ex. 5: Length in relation to: much shorter (1), moderately shorter (3), equal (5), moderately longer (7), much longer (9)

Ex. 6: Shape in cross section: strongly concave (1), moderately concave (3), flat (5), moderately convex (7), strongly convex (9)

Ex. 7: Position of maximum width: much closer to base (1), moderately closer to base (3), in middle (5), moderately closer to apex (7), much closer to apex (9)

113. Wording of Even Notes: As in other quantitative characteristics, the even states are worded by combining the wording of the preceding and following states by using the word “to”, e.g. “much smaller to smaller.” Examples would thus read in full:

much smaller (1), much smaller to moderately smaller (2), moderately smaller (3), moderately smaller to same size (4), same size (5), same size to moderately larger (6), moderately larger (7), moderately larger to much larger (8), much larger (9).

114. Limited Range: In cases where the full scope of differences is so small that only a limited range of close states can be observed, these states should receive the notes 3, 4, 5, 6, 7, as in the following example:

Shape: moderately concave (3), moderately concave to flat (4), flat (5), flat to moderately convex (6), moderately convex (7)

3.3 Pseudo-qualitative Characteristics

115. Pseudo-qualitative characteristics are characteristics that do not fit the definition of truly qualitative characteristics, but are treated as qualitative when it is more reasonable to disregard continuous variation for practical purposes and the states created are meaningful and sufficiently different from each other (e.g. shape: ovate (1), elliptic (2), round (3), obovate (4), or expression: absent or very weakly expressed (1), weakly expressed (2), strongly expressed (3)).

116. They are characteristics of which the states of expression, although having the possibility of continuous variation from one extreme to the other, do not form an extended linear range as in the case of quantitatively expressed characteristics. In cases where it is considered more reasonable to make further differentiation between the states of expression, intermediate states may be included, provided that they are adequately worded and the states created are sufficiently different from one another.

3.3.1 Pseudo-qualitative Characteristics With Only Two States of Expression

117. When preparing characteristics with only two states of expression, one should always consider whether it would be more reasonable to include an intermediate state in order to make provision for varieties expressing an intermediate situation. It is recommended that all characteristics should preferably consist of more than two states of expression, unless it is clear that no intermediates exist in that particular case.

Aperture of eye: closed (1), open (2) (category 3.3.1)

Aperture of eye: closed (1), slightly open (2), wide open (3) (condensed qualitatively expressed form of category 3.3.5)

Other examples are:

Ex. 1: Growth habit: upright (1), pendulous (2)

Ex. 2: Persistence of leaves: deciduous (1), evergreen (2)

Ex. 3: Position: adpressed (1), free (2)

Ex. 4: Symmetry: symmetric (1), asymmetric (2)

Ex. 5: Transition: gradual (1), abrupt (2)

Ex. 6: Undulation: flat (1), undulating (2)

3.3.2 Pseudo-qualitative Characteristics With More Than Two States of Expression in a Non-linear Range

118. The states of expression may either form a nonlinear range or a combined nonlinear and linear range.

119. Qualitative Expression: All characteristics showing nonlinear variation between some or all of their states of expression are presented qualitatively, even though there may be continuous variation from one extreme to the other, because of the difficulty to establish a

range of equidistant states arranged symmetrically on either side of a “medium” or “moderate” state.

120. Inclusion of Intermediate States: If experts consider it more reasonable to make further differentiation between the states of expression, because they are able to identify more differences between states they may decide to include intermediate states, provided that they are adequately worded and the states created are sufficiently different from one another.

Color: green (1), yellow (2), red (3)
would become

Color: green (1), yellow green (2), green yellow (3), yellow (4), orange (5), red (6)

121. The wording for intermediate states should preferably not be formed by combining the wording of the preceding and following states by using the word “to”:

Not: Shape: round (1), elliptic (2), elliptic to ovate (3), ovate (4)

But: Shape: round (1), elliptic (2), ovate-elliptic (3), ovate (4)

122. However, in cases where an adequate term to describe a certain intermediate shape is lacking, the word “to” may be used:

Shape: elliptic (1), broad ovate to deltoid (2), obovate (3)

123. Words such as “intermediate” should preferably not be used, and should definitely not be used more than once in a single characteristic:

Not: Shape: round (1), intermediate (2), elliptic (3), intermediate (4), ovate (5)

But: Shape: round (1), round-elliptic (2), elliptic (3), elliptic-ovate (4), ovate (5)

124. Combination of Nonlinear and Linear Ranges: It is acceptable to combine different degrees of a particular expression with another expression, (combined nonlinear and linear range), but in that case each degree of expression should have a qualifying adjective in order to make all states mutually exclusive.

Not: Color: light green (1), green (2), dark green (3), purple green (4)

But: Color: light green (1), medium green (2), dark green (3), purple green (4)

125. Dimensions of simple plane shapes have been mathematically determined and the “medium” state does not need a qualifying adjective to make the states mutually exclusive.

Not: Shape: broad elliptic (1), medium elliptic (2), narrow elliptic (3), ovate (4)

But: Shape: broad elliptic (1), elliptic (2), narrow elliptic (3), ovate (4)

126. Further examples are:

Ex. 1: Color: green (1), yellow green (2), yellow (3), orange yellow (4), orange (5), red (6), purple (7)

Ex. 2: Color pattern: one-colored (1), edged (2), striated (3), speckled (4), striated-speckled (5), shaded off (6), irregularly marked (7), flushed (8)

- Ex. 3: Incisions of margin: sinuate (1), crenate (2), dentate (3), serrate (4)
 Ex. 4: Pubescence: smooth (1), pubescent (2), prickled (3)
 Ex. 5: Shape: round (1) broad elliptic (2), elliptic (3), ovate-elliptic (4), ovate (5)
 Ex. 6: Structure: slightly grooved (1), moderately grooved (2), strongly grooved (3), embossed (4)

3.3.3 Pseudo-qualitative Characteristics With Individual And Combined States of Expression

127. These are qualitatively expressed characteristics containing two or more individual expressions and one or more combinations. The alternatives are listed first, followed by the combinations.

Examples

- Ex. 1: Adherence: to embryo (1), to flesh (2), to neither (3)
 Ex. 2: Color: only green (1), only purple (2), green and purple (3)
 Ex. 3: Color pattern: self-colored (1), striped (2), maculate (3), striped and maculate (4)
 Ex. 4: Distribution: at base only (1), at distal part only (2), evenly distributed (3)
 Ex. 5: Position: below middle (1), in middle (2), above middle (3), along most of its length (4)
 Ex. 7: Sex expression: female flowers only (1), female and male flowers (2), female, male and hermaphrodite flowers (3)

3.3.4 Pseudo-qualitative Characteristics With More Than Two States of Expression in a Linear Range

128. Pseudo-qualitative characteristics with more than two states of expression in a linear range are intermediate between quantitative characteristics and qualitative characteristics. The typical quantitative pattern either does not exist or may easily be lost by simply adding or deleting one or more basic states of expression. Any symmetry that may have existed around a “medium” state is thereby distorted. The linear range may even be made up of a number of basic expressions, each fixed and independently meaningful. These basic expressions are sometimes combined with different degrees of expression, which may form part of the range. It is often not possible to identify a “medium” state and sometimes even the linearity of the range is not very clear. The range may furthermore change course and become nonlinear at any point, in which case the characteristic will resort under 3.3.2.

129. Because of these problems, it may be preferable to express all these characteristics qualitatively unless the quantitative expression is specifically required in a particular situation. The qualitative expression is normally used in any case whenever the symmetry is lost and it has to be used if the linearity is lost. If it is decided to express any of these characteristics quantitatively for some reason, the states should be more or less evenly spaced and the wording of the even states will have to be taken into consideration for the sake of variety descriptions.

130. In the following example the expression becomes qualitative by mere addition of one state:

Shape: elliptic (3), round (5), oblate (7)
would become
Shape: narrow elliptic (1), elliptic (2), round (3), oblate (4)

131. In the following example the expression becomes qualitative when the range changes in a nonlinear direction:

Shape: elliptic (3), round (5), oblate (7)
would become
Shape: elliptic (1), round (2), oblate (3), ovate (4)

132. Dividing a State Into Two or More Degrees of Expression: If the experts consider it more reasonable to identify different degrees of expression they may decide to divide a state into two or more degrees of expression provided they are adequately worded and the different states created are sufficiently different from one another.

Examples:

- Ex. 1: Growth habit: climbing (1), upright (2), spreading (3)
would become
Growth habit: strongly climbing (1), slightly climbing (2), upright (3), spreading (4)
- Ex. 2: Shape of apex: acute (1), obtuse (2), rounded (3)
would become
Shape of apex: narrow acute (1), broad acute (2), narrow obtuse (3), broad obtuse (4), rounded (5)

133. Mutually Exclusive Wording for States of Expression: Each basic expression should be self-explanatory and independently meaningful and terms such as “intermediate” should be avoided. If different degrees of expression are combined with some basic expressions, the wording of each state should be mutually exclusive:

Attitude (in relation to plant parts): adpressed (1), oblique (2), perpendicular (3), slightly recurved (4), strongly recurved (5)

States 4 and 5 should not read: recurved (4), strongly recurved (5)

134. Full Plane Shapes: Simple full plane shapes are divided into mathematically determined groups with regard to their length / width ratios and they should be indicated accordingly. The terms “elliptic” and “broad elliptic” each have specific dimensions and are mutually exclusive. They form part of the following full range:

Shape: narrow elliptic (1), elliptic (2), broad elliptic (3), round (4), narrow oblate (5), oblate (6), broad oblate (7) (qualitatively expressed)

Therefore the combination “medium elliptic” does not exist. It is different to the case of color where “medium green” has to be used if another state is “light green” or “dark green.”

135. Attitude (in Relation to Soil Level): States of expression not existing in a particular situation need not be listed and states 5 and/or 7 need not be maintained. However, all states have to be listed equidistantly. The full range would read as follows:

Attitude: erect (1), erect to semi-erect (2), semi-erect (3), semi-erect to horizontal (4), horizontal (5), horizontal to semi-drooping (horizontal to semi-pendulous) (6), semi-drooping (semi-pendulous) (7), semi-drooping to drooping (semi-pendulous to pendulous) (8), drooping (pendulous) (9)

136. The following asymmetrical possibilities would be allowed: 1, 3, 5 or 1, 2, 3, 4 or 1, 2, 3, 4, 5 or 1, 3, 5, 7, etc.

137. The term “prostrate” may replace “horizontal” for cases where the soil level prevents any further states being expressed. In this case the (quantitatively expressed) states would read:

Attitude: erect (1), erect to semi-erect (2), semi-erect (3), semi-erect to prostrate (4), prostrate (5)

138. Asymmetrically indicated quantitative characteristics beginning with state 1 present a problem in that one cannot judge, by merely looking at the states of expression, whether they are quantitative or qualitative. It is not clear whether the states of the above example form part of the 1 - 9 quantitative scale or whether the characteristic is presented qualitatively. When it is more practical to observe only a condensed range, such a characteristic may be expressed qualitatively, as follows:

Attitude: erect (1), semi-erect (2), prostrate (3)

3.3.5 Pseudo-qualitative Characteristics Representing a Quantitative Characteristic in a Condensed Qualitatively Expressed Form

139. If in a quantitative characteristic it is difficult to observe more than two extreme states with a “grey area” in between the range of nine states it is compressed to states with the Notes 1, 2, 3. These states should, if possible, be formed in an alternative way to the usual 1 to 9 scale (e.g. absent or very weakly expressed (1), weakly expressed (2), strongly expressed (3) and not absent or very weak (1), weak (2), strong (3)). This category also covers cases where experts consider it more reasonable to use only a condensed range of the full quantitative range of either three or five qualitatively expressed states.

(a) Examples for the first case are:

Ex. 1: Bloom: absent or very weakly expressed (1), weakly expressed (2), strongly expressed (3)

Ex. 2: Curvature: straight (1), slightly curved (2), strongly curved (3)

Ex. 3: Glossiness: dull (1), slightly glossy (2), very glossy (3)

- Ex. 4: Hairiness: absent or very slightly hairy (1), slightly hairy (2), strongly hairy (3)
- Ex. 5: Shape in cross section: flat (1), slightly convex (2), strongly convex (3)
- Ex. 6: Symmetry: symmetric (1), slightly asymmetric (2), clearly (strongly) asymmetric (3)

(b) Examples for the second case are:

- Ex. 1: Angle: acute (1), right angle (2), obtuse (3)
or: Angle: very acute (1), moderately acute (2), right angle (3), moderately obtuse (4), very obtuse (5)
- Ex. 2: Position of maximum width: towards base (1), in middle (2), towards apex (3)
or: Position of maximum width: strongly towards base (1), moderately towards base (2), in middle (3), moderately towards apex (4), strongly towards apex (5)
- Ex. 3: Ratio, length / width: broader than long (1), as broad as long (2), longer than broad (3)
or: Ratio, length/width: much broader than long (1), moderately broader than long (2), as broad as long (3), moderately longer than broad (4), much longer than broad (5)

140. Further examples are:

- Ex. 4: Adherence: non-adherent (1), semi adherent (2), fully adherent (3)
- Ex. 5: Aperture of eye: closed (1), semi open (partly open) (2), fully open (3)
- Ex. 6: Attitude (in relation to soil level): erect (1), semi erect (2), prostrate (3)
- Ex. 7: Attitude (in relation to soil level): erect (1), horizontal (2), drooping (pendulous) (3)
- Ex. 8: Development: absent (1), partly developed (2), fully developed (3)
- Ex. 9: Exposure: fully exposed (1), somewhat concealed (2), fully concealed (3)
- Ex. 10: Persistence: none (1), partial (2), total (3)
- Ex. 11: Position: at base (1), in middle (2), at apex (3)
- Ex. 12: Structure: hollow (1), semi solid (2), solid (3)

4. GLOSSARY OF BOTANICAL TERMS

4.1 Two-dimensional Shape

ACICULAR	Like the outline of a needle; rigid, elongate, and tapering to a fine point from a narrow base.
ARCUATE	Curved more or less regularly, like the outline of a circle.
ATTENUATE	Tapering; gradually diminishing in width toward one end.

Remark: In the strict sense this term describes a structure that tapers, and is normally used only for a leaf base, “acuminate” is the equivalent term used for the tip. However, some authors qualify the description to only include a structure in which the sides taper concavely to the point. All Technical Working Parties should agree on one definition of the term before the final version of the document. The published definitions of “acuminate” present the same problem, which must be resolved if these terms are used in Test Guidelines.

BILOBATE	With two lobes.
CLAWED (UNGUICULATE)	Abruptly contracted to a narrow and often elongate basal portion (usually of petals and sepals).
CORDATE (RHS)	Heart-shaped in overall outline; with two rounded basal lobes, the whole broadest near the base and tapering fairly straightly to the apex.
CUNEATE (RHS)	Wedge-shaped; inversely triangular with more or less straight margins and obtuse or acute angles.
DELTATE (RHS)	Equilaterally triangular, the point of attachment at one of the broad ends.

Remark: There is confusion as to the correct word ending. The RHS uses “oid” but this is the ending for a solid shape, not a plane shape.

ELLIPTIC (RHS)	Oval; broadest at the middle with margins tapering convexly and uniformly to either end.
FALCATE (RHS)	Sickle-shaped.
FURCATE	Forked.
HASTATE (RHS)	Generally triangular, gradually enlarged basally from an acute apex, then abruptly expanded into two acute, widely divergent basal lobes.
LANCEOLATE (RHS)	Lance-tip-shaped in overall outline; broadest towards the base with more or less straight margins between the broadest point and the apex (three times as long as broad).
LIGULATE (LORATE)	Strap-shaped in overall outline; moderately narrow, moderately elongate, with the lateral margins parallel.
LINEAR (RHS)	Narrow, elongate, with the lateral margins parallel.
LOBED	With two or more distinct but not wholly separate subdivisions.
LUNATE (RHS)	Crescent-shaped with the ends more or less acute.
OBCORDIFORM	Inversely cordiform.
OBDELTATE	Inversely deltate, the point of attachment at one of the points.
OBLANCEOLATE (RHS)	Inversely lanceolate.
OBLATE	Oblong with the longest dimension orientated transversely.

OBLIQUE (RHS)	With the sides or halves unequal; bilaterally asymmetrical.
OBLONG (RHS)	Broadest at middle and longer than broad, with more or less parallel sides terminating at both ends.
OBOVATE (RHS)	Inversely ovate.
OBTRULLATE	Inversely trullate.
ORBICULAR	Round.
OVATE (RHS)	Chicken-egg-shaped in overall outline; broadest near the base, the margin entirely convex.
PALMATE (RHS)	With three or more free lobes whose axes radiate from a common center.
PALMATIFIED:	Palmately cleft rather than lobed.
RECTANGULAR	Quadrangular; four-sided with opposite sides parallel and all angles approximately 90 degrees. Opposite sides are of equal length but adjacent sides are different in length.
RENIFORM (RHS)	Kidney-shaped in general outline; thickly lunate with rounded ends.
RHOMBIC (RHS)	Diamond-shaped. Broadest at the middle and tapering to an acute angle at each end, the lateral margins with obtuse angles at the middle and more or less straight between the middle and the ends.
SAGGITATE	Arrowhead-shaped in overall outline; generally triangular, gradually enlarged basally from an acute apex, with two acute basal lobes directed downward.
SPATULATE (SPATHULATE) (RHS)	Spatula-shaped in overall outline; attenuate basally, broadly expanded distally, the distal portion with a convex margin.
SQUARE	Equilaterally quadrangular, with all sides in the same length.
SUBORBICULAR (SUBROTUND, SUBCIRCULAR)	Slightly compressed-orbicular.
SUBULATE	Awl-shaped; tapering from a narrow base to a fine sharp point.
TRIANGULAR	With three more or less straight sides, broadest at the base.
TRULLATE	Trowal shaped; broadest below the middle and tapering to each end, the lateral margins angled at the point of greatest breadth and more or less straight between the middle and ends.

4.2 Solid or Three-dimensional Shape

ACICULAR (ACEROSE)	Needle-shaped; rigid, elongate and tapering to a fine point from a narrow base. Rounded in transverse section..
CAMPANULATE	Bell-shaped; with an inflated tube gradually enlarging distally into the limb.
CANALICULATE	Chanelled; gutter-shaped; elongate, with one side concave longitudinally.
COMPRESSED	Flattened laterally or lengthwise.
CONIC	Cone-shaped; circular in transection with more or less straight sides converging from a circular base to an acute apex.
CUNEIFORM	Obpyramidal, with the proportions of a wedge.
CYLINDRIC	Solid, elongate, circular in transverse section, with a uniform diameter.
ELLIPSOID	With an elliptic outline when viewed from any side perpendicular to the longitudinal axis.
FUSIFORM	Spindle-shaped; elongate, centrally thick, tapering to the ends.
GLOBOSE (SPHEROID)	Spheric; round in outline when viewed from any angle and in transverse section.
INFUNDIBULAR	Funnel-shaped; with a narrowly obconic tube gradually enlarged distally into a more divergent limb.
LENTICULAR	Lens shaped; doubly convex, narrow and acute at each end.
OBCONIC	Inversely conic.
OBLOID	Spherical but compressed on two opposite sides.
OBOVOID	Inversely ovoid.
OVOID	Chicken-egg-shaped; with an ovate outline when viewed from any side perpendicular to the longitudinal axis.
RHOMBOID	Diamond-shaped; square in transverse section, widest and angled at the middle, tapering from there to each end, the lateral faces plane and converging toward the acute ends.
TERETE	Elongate, tapering, and circular in transverse section.
TUBULAR	Cylindric and hollow.

4.3 Shape of Apex or Shape of Tip

ACUMINATE	Tapering concavely to an acute or obtuse tip.
ACUTE	With more or less straight margins terminating in a point at an angle of less than 90 degrees.
APICULATE	Terminating abruptly in a small point which is laminar in nature.
ARISTATE	Awned; bearing a hard, straight, bristle-like continuation of the primary vein which may be terminal or may separate from the lamina below its apex.
BARBED	Terminating abruptly in an acutely reflexed hook.
CAUDATE	Tailed; abruptly terminating in a long, flexuous, and narrowly acuminate point of laminar nature.
CIRRHOUS	Terminating in a narrow spiraled tip which is a continuation of the primary vein. A cirrus is a tendril.
CUSPIDATE	Tapering gradually to a rigid point which is both vascular and laminar in nature.
EMARGINATE	Notched, with an acute sinus.
MUCRONATE	Terminating abruptly in a short, hard point which is a continuation of the primary vein.
MUCRONULATE	Minutely mucronate, diminutive of mucronate.
OBLIQUE	Inequilateral; bilaterally asymmetrical.
OBTUSE	Blunt; terminating gradually in a rounded tip capable of enclosing an angle of 90 degrees.
PUNGENT	Abruptly terminating in a rigid, sharp point which is both vascular and laminar in nature (as in a Yucca leaf).
RETUSE	Notched, with a small central, obtuse sinus. The adjacent lobes are rounded or obtuse.
ROSTRATE	Terminating gradually in a long, rigid, straight point which is both vascular and laminar in nature.
ROUNDED	Curved like the arc of a circle with no distinct tip.
SPINOSE	Terminating in a rigid, needle-like continuation of the primary vein.
SPINULOSE	Minutely spinose; diminutive of spinose.
TRUNCATE	With the sides abruptly rounded to a straight, transverse distal margin. The apex of the leaf is squared at the end as if cut off.
UNCINATE	Hooked; terminating abruptly in an obtusely recurved point.

4.4 Shape of Base

ATTENUATE	Narrowed gradually with the lateral margins concave.
AURICULATE	Eared; with small rounded lobes standing out to either side of the base.
CORDATE	Heart-shaped; with two equal, more or less rounded lobes and a deep basal sinus between, the lobes either overlapping one another or not.
CUNEATE	Wedge-shaped; inversely triangular, the lateral margins straight and converging at either an acute or obtuse angle.
DECURRENT	Running downward; with the lamina prolonged downward and adherent to the stem below the point of vascular insertion.
HASTATE	Arrow-shaped with two equal, more or less triangular lobes directed outward, away from the stalk (see also saggitate).
OBLIQUE	Inequilateral; bilaterally asymmetrical.
OBTUSE	Blunt; rounded and capable of enclosing an angle of 90 degrees.
ROUNDED	Curved like the arc of a circle with no distinct terminus.
SAGGITATE	Arrowhead-shaped; with two equal, more or less triangular lobes directed downward (see also hastate).
TRUNCATE	With the lateral margins abruptly rounded to a straight, transverse proximal margin.

4.5 Type of Margin

ACULEATE	With stiff, sharp, spine-like projections (prickles).
BICRENATE	Doubly crenate; with the crenations themselves crenate.
BISERRATE	Doubly serrate; with the serrations themselves serrate.
CILIATE	With fine, hair-like trichomes standing out in the plane of the lamina.
CRENATE	Scalloped; teeth rounded with a pointed tip.
CRENULATE	Finely crenate; diminutive of crenate.
CRISPATE	Curled; closely and irregularly divided and twisted.
DENTATE	With coarse, acute teeth <u>directed outward</u> . The sides of the teeth represent two sides of an equilateral triangle.
DENTICULATE	Finely dentate; diminutive of dentate.
ENTIRE	Undivided.
EROSE	Gnawed; irregularly toothed, as if chewed.
FIMBRIATE	Fringed; closely and finely divided perpendicular to the outer boundary.
FIMBRIOLATE	Finely fringed; diminutive of fimbriate.
INVOLUTE	Rolled inward toward the adaxial surface.
REPAND	Shallowly sinuate.
REVOLUTE	Rolled backward toward the abaxial surface.
SERRATE	With coarse acute teeth <u>directed forward towards the apex/tip</u> .
SERRULATE	Finely serrate; diminutive of serrate.
SINUATE	Alternatively concave and convex; wavy, the waves perpendicular to the outer boundary and in the plane of the lamina.
UNDULATE	Wavy perpendicular to the plane of the lamina.

4.6 Some Frequently Used Terms

(for further terms see document TC/33/9):

English	français	deutsch	español
absent	absent, absente	fehlend	ausente
adpressed	appliqué	anliegend	alineado
broad	grande, large	breit	anchura
brown	brune	braun	marron
closed	fermé	geschlossen	cerrado
columnar	columnaire	Spur	columnar
conical	conique	kegelförmig	cónico
crenate	crénelé	gekerbt	crenado
dark	foncée	dunkel	oscuro
dark pink	rose foncé	dunkelrosa	rosa oscuro
deep	profonde	tief	profundo
drooping	retombant	überhängend, sehr stark überhängend	colgante
downwards	retombant	hängend	
ellipsoid	ellipsoïde	ellipsoid	elipsoide
fastigate	très dressé	sehr aufrecht	muy erecto
few	petit	gering	poco, pequeño
flat	aplatie	abgeplattet	aplanado
free	disjoints	freistehend	libre, suelto
globose	globuleuse	kugelförmig	globuloso
green	verte	grün	verde
held out	décollé	abstehend	postrado
high	forte	hoch	alto
large	élevé, grand, grande, gros	groß	grande
light	claire	hell	claro
light pink	rose pâle	hellrosa	rosa claro
long	long, longs	lang	largo
low	faible	gering	bajo
many	grand	groß	mucho, grande
medium	moyen, moyenne	mittel	medio, media
middle,in	au milieu	in der Mitte	en el medio
narrow	étroit, étroite, petite	schmal	estrecho
normal	normal	normal	normal
obloid	globuleuse aplatie kugelförmig	abgeplattet aplanado	globuloso
oblong	oblongue	rechteckig	oblongo
open	ouvert	offen	abierto
orange	orange	orange	naranja
outwards	horizontal	waagrecht	horizontal
overlapping	chevauchants	überlappend	superpuesto
ovoid	ovale	eiförmig	ovalado

partly open	partiellement ouvert	teilweise offen	parcialmente abierto
pink	rose	rosa	rosa
purple	pourpre, violette	purpur	púrpura
ramified	ramifié	verzweigt	ramificado
red	rouge	rot	rojo
semi-upright	demi-dressé	halbaufrecht	semi-ascendente
serrate	dentelé	gesägt	serrado
shallow	peu profonde	flach	superficial
short	court, courts	kurz	corto
slightly held out	légèrement décollé	leicht abstehend	ligeramente postrado
small	petit, petite	klein	pequeño
spreading	divergent étalé	breitwüchsig überhängend	rastrero
spur	spur	Spur	estolón
strong	fort, forte	stark	fuerte
strongly held out	nettement écollé	deutlich abstehend	muy postrado
thick	épaisse, gros	dick	grueso, compacto
thin	fin, mince	dünn	delgado
touching	tangents	sich berührend	rozante
towards	vers le -	zum - hin	hacia el/la
truncate	tronquée	stumpf	truncado
upright	dressé	aufrecht	erecto
upwards	dressé	aufrecht	erecto
very weak	très faible	sehr gering	muy débil
weak	faible	gering	débil
weeping	pleureur	lang überhängend	lorón
white	blanche	weiß	blanca
whitish yellow	aune blanchâtre	weißlich-gelb	amarillo
yellow	jaune	gelb	blanquecino
yellowish	jaunâtre	gelblich	amarillo amarillento

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