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WORKING PAPER ON TEST GUIDELINES FOR FODDER RADISH
(*Raphanus sativus* L. var. *oleiformis* Pers.)

Document prepared by experts from Germany

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I. Subject of these Guidelines

These Test Guidelines apply to all varieties of *Raphanus sativus* L. var. *oleiformis* Pers.

II. Material Required

1. The competent authorities decide when, where and in what quantity and quality the plant material required for testing the variety is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must make sure that all customs formalities are complied with. The minimum quantity of seed to be supplied by the applicant in one sample should be:

1000 g

The seed should at least meet the minimum requirements for germination capacity, moisture content and purity for marketing certified seed in the country in which the application is made. The germination capacity should be as high as possible.

2. The plant material must not have undergone any treatment unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

III. Conduct of Tests

1. The minimum duration of tests should normally be two similar growing periods.

2. The tests should normally be conducted at one place. If any important characteristics of the variety cannot be seen at that place, the variety may be tested at an additional place.

3. The field tests should be carried out under conditions ensuring normal growth. The distance between rows and between plants within the rows should be adjusted to enable observations on individual plants. The size of the plots should be such that plants or parts of plants may be removed for measurement and counting without prejudice to the observations which must be made up to the end of the growing period. Each test should include as a minimum 300 plants which should be divided between three or more replicates. In addition each test should include a replicate of minimum 300 plants for the characteristics assessed by observation of a group of plants.

4. Additional tests for special purposes may be established.

IV. Methods and Observations

1. Unless otherwise stated, all observations for assessment of distinctness and stability should be made on 60 plants or part of plants.

2. For the assessment of uniformity

- unless otherwise stated, all observations determined by measurements should be made on 60 plants or part of plants (M)

- all visual observations of a number of individual plants or parts of plants should be made on 100 plants (VS)

- all single observations of a group of plants or parts of plants should be made on the total plot of minimum 300 plants (VG).

The variability within the variety should not exceed the variability of comparable varieties already known.

V. Grouping of Varieties

1. The collection of varieties to be grown should 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. Their various states of expression should be fairly evenly distributed throughout the collection.

2. It is recommended that the competent authorities use the following characteristics for grouping varieties:

(a) Ploidy: (characteristic 1)
(b) Time of Flowering (characteristic 12)
(c) Flower: Color of petals (characteristic 14)

VI. Characteristics and Symbols

1. To assess distinctness, uniformity and stability, the characteristics and their states as given in the Table of Characteristics should be used.

2. Notes (numbers), for the purposes of electronic data processing, are given opposite the states of expression for each characteristic.

3. Legend:

(*) Characteristics that should be used on all varieties in every growing period over which examinations are made and always be included in the variety descriptions, except when the state of expression of a preceding characteristic or regional environmental conditions render this impossible.

(+) See Explanations on the Table of Characteristics in Chapter VIII.

1) The optimum stage of development for the assessment of each characteristic is indicated by a number in the second column. The stages of development denoted by each number are described at the end of chapter VIII.

M: actual measurement

VG: visual assessment by a single observation of a group of plants or parts of plants

VS: visual assessment by observations of a number of individual plants or parts of plants.

VII. Table of Characteristics

Characteristics			Stage[1)]		Example Varieties	Note
(*)	1. (+)	Ploidy	05	diploid	Pegletta	2
				tetraploid	Romulus	4
	2. (+)	Cotyledon: length	11	short		3
			M	medium	Siletina	5
				long	Mira	7
	3. (+)	Cotyledon: width	11	narrow		3
			M	medium	Siletina	5
				broad	Iris	7
(*)	4.	Leaf: green color	19-30	light		3
			VG	medium	Diabolo	5
				dark	Mator	7
	5. (+)	Leaf: lobes	19-30	absent		1
			VS	present	Pegletta	9
	6. (+)	Leaf: number of lobes (fully developed leaf)	19-30	few	Colonel	3
			M	medium	Nemex	5
				many	Regresso	7
	7. (+)	Leaf: dentation of margin	19-30	weak	Pecari	3
			VG	medium	Resal	5
				strong	Kwatro	7
	8. (+)	Leaf: length (blade and petiole)	19-30	short	Tempo	3
			M	medium	Resal	5
				long	Toro	7
	9. (+)	Leaf: width (widest point)	19-30	narrow	Tempo	3
			M	medium	Resal	5
				broad	Slobolt	7

Characteristics			Stage[1)]		Example Varieties	Note
	10. (+)	Leaf: length of petiole	19-30	short	Tempo	3
			M	medium	Resal	5
				long		7
	11. (+)	Plant: height at emergence of flower buds	52	low	Colonel	3
			VG	medium	Toro	5
				tall	Siletta Nova	7
(*)	12. (+)	Time of flowering	60	very early	Iris	1
			M	early	Siletina	3
				medium	Trick	5
				late	Nemex	7
				very late	Ultimo	9
	13. (+)	Plant: height at flowering	65	low	Tempo	3
			VG	medium	Resal	5
				tall	Siletta Nova	7
(*)	14 (+)	Flower: color of petals	65	white	Ultimo	1
			VS	violet	Radical, Toro	2
				reddish	Mator	3
				yellow		4
(*)	15.	Plant: total length	89	very short	Mator	1
			M	short	Toro	3
				medium	Adagio	5
				long	Siletta Nova	7
				very long		9

Characteristics			Stage[1)]		Example Varieties	Note
(*)	16. (+)	Siliqua: length (between peduncle and beak)	89	short	Tempo	3
			M	medium	Pegletta	5
				long	Ultimo	7
	17. (+)	Siliqua: length of beak	89	short	Tempo	3
			M	medium	Siletina	5
				long	Toro	7
	18. (+)	Siliqua: width	89	narrow	Radical	3
			M	medium	Toro	5
				broad	Pegletta	7
	19. (+)	Siliqua: length of peduncle	89	short	Nemex	3
			M	medium	Mator	5
				long	Toro	7
	20. (+)	Siliqua: number of seeds	89	low	Romulus	3
			M	medium	Pegletta	5
				high		7
	21.	Seed: Thousand seed weight	89	very low		1
			M	low	Siletina	3
				medium	Adagio	5
				high		7
				very high	Romulus	9
	22. (+)	Tendency to form inflorescences in year of sowing for late summer sown trials	VG	absent or very weak	Ultimo	1
				weak	Resal	3
				medium	Romulus	5
				strong	Pegletta	7
				very strong	Iris	9

Characteristics		Stage[1)]		Example Varieties	Note
(*) (+)	23. Root: color		white	Nemex	1
		VS	red	Mator	2
			violet		3
			blackish brown		4

VIII. Explanations on the Table of Characteristics

Ad. 1: Ploidy

Ploidy should be assessed on at least 100 seedlings.

Ad. 2 + 3: Cotyledon: length (2) and width (3)

The measurements should be taken in the glasshouse. If the two cotyledons differ in size, the bigger one should be measured. The length is defined as distance between the inclination at top of the cotelydon and the point where the width of the petiole is about 4 mm. The width of the cotyledon should be measured at the widest point of the cotyledons.

Ad. 5 + 6: Leaf: presence (5) and number of lobes (6)

Absence or presence of lobing should be observed on the whole plant at rosette stage. Parts of the leaf blade are considered as lobes if their length is at least equivalent to the width of the leaf petiole at their point of attachment and if the upper notch of the blade has at least half the length of the lobe itself.

Ad. 7 – 10: Leaf: dentation (7), length (8), width (9), length of petiole (10)

7 = part on which the dentation should be recorded (characteristic 7)

Ad 11: Plant: height at emergence of flower buds

The height of the plants should be assessed when 50% of the plants have reached stage 52. The mean height of plants in stage 52 should be measured.

Ad 12: Time of flowering

The observation should be done at least three times per week and more frequently if there is any need to do so. The date should be calculated - if necessary by interpolation– at which 50% of plants show at least one open flower.

Ad. 13: Plant: height at flowering

The height of the plants should be assessed when all normally developed plants have opened at least one flower.

Ad. 14: Flower: color of petals

The violet and reddish color should be observed independent of its extension on the petal.

white or yellow	violet or reddish

For varieties which show a segregation of plants with violet petals and white petals or with reddish petals and white petals the proportions of the states of expressions should be recorded. A segregation of plants with three different colors is not tolerated.

Ad. 16-20: Siliqua

All observations on the siliqua should be recorded in the midpart of the inflorescence of the main stem or top branch.

Ad. 22: Tendency to form inflorescence in year of sowing for late summer sown trials

In a separate sowing the observation of the growth stage should be made in autumn, when the development stagnates.

Ad. 23: Root: color

In a separate sowing in late summer with half the density of the normal plots the color of skin should be recorded when the development in autumn stagnates.

The color is observed independent of its extension on the root and its intensity, immediately after lifting of the roots.

KEY FOR THE GROWTH STAGES

Code	Description
Principal growth stage 0: Germination	
00	Dry seed
01	Beginning of seed imbibition
03	Seed imbibition complete
05	Radicle emerged from seed
07	Hypocotyl with cotyledons emerged from seed
08	Hypocotyl with cotyledons growing towards soil surface
09	Emergence: cotyledons emergence through
Principal growth stage 1: Leaf development [1]	
10	Cotyledons completely unfolded
11	First leaf unfolded
12	2 leaves unfolded
13	3 leaves unfolded
1.	Stages continuous till...
19	9 or more leaves unfolded
Principal growth stage 2: Formation of side shoots	
20	No side shoots
21	Beginning of side shoot de development: first side shoot detectable
22	2 side shoots detectable
23	3 side shoots detectable
2.	Stages continuous till...
29	End of side shoot development: 9 or more side shoots detectable
Principal growth stage 3: Stem elongation [2]	
30	Beginning of stem elongation: no internodes (“rosette”)
31	1 visibly extended internodes
32	2 visibly extended internodes
33	3 visibly extended internodes
3.	Stages continuous till...
39	9 or more visibly extended internodes
Principal growth stage 4: --	
Principal growth stage 5: Inflorescence emergence	
50	Flower buds present, still enclosed by leaves
51	Flower buds visible from above ("green bud")
52	Flower buds free, level with the youngest leaves
53	Flower buds raised above the youngest leaves
55	Individual flower buds (main inflorescence) visible but still closed
57	Individual flower buds (secondary inflorescences) visible but still closed
59	First petals visible, flower buds still closed ("colored bud")

Code	Description
Principal growth stage 6: Flowering	
60	First flowers open
61	10% of flowers on main raceme open, main raceme elongating
62	20% of flowers on main raceme open
63	30% of flowers on main raceme open
64	40% of flowers on main raceme open
65	Full flowering 50% flowers on main raceme open, older petals falling
67	Flowering declining: majority of petals fallen
69	End of flowering
Principal growth stage 7: Development of fruit	
71	10% of pods have reached final size
72	20% of pods have reached final size
73	30% of pods have reached final size
7.	Stages continuous till...
78	80% of pods have reached final size
79	Nearly all pods have reached final size
Principal growth stage 8: Ripening	
80	Beginning of ripening: seed green, filling pod cavity
81	10% of pods ripe, seeds dark and hard
82	20% of pods ripe, seeds dark and hard
83	30% of pods ripe, seeds dark and hard
8.	Stages continuous till...
88	80% of pods ripe, seeds dark and hard
89	Fully ripe: nearly all pods ripe, seeds dark and hard

IX. Literature

Growth stages of mono- and dicotyledonous plants: BBCH-Monograph. Federal Biological Research Centre of Agriculture and Forestry (ed.) Ed. by Uwe Meier.-Berlin; Wien [u.a.]: Blackwell Wiss.-Verl., 1997, pp. 26-30.

X. Technical Questionnaire

	Reference Number (not to be filled in by the applicant)

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Species	*Raphanus sativus* L. var. *oleiformis* Pers. FODDER RADISH
2. Applicant (Name and address)	
3. Proposed denomination or breeder's reference	

4. Information on origin, maintenance and reproduction of the variety

4.1 Genetic origin and breeding method

(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

Yes [ ] No [ ]

(b) Has such authorization been obtained?

Yes [ ] No [ ]

If the answer to that question is yes, please attach a copy of such an authorization.

4.2 Other information

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the state of expression which best corresponds).

	Characteristics	Example Varieties	Note
5.1 (1)	**Ploidy**		
	diploid	Pegletta	2[ ]
	tetraploid	Romulus	4[ ]
5.2 (12)	**Time of flowering**		
	very early	Iris	1[ ]
	early	Siletina	3[ ]
	medium	Trick	5[ ]
	late	Nemex	7[ ]
	very late	Ultimo	9[ ]
5.3 (14)	**Flower color of petals (main color ..... %)**		
	white	Ultimo	1[ ]
	violet	Radical, Toro	2[ ]
	reddish	Mator	3[ ]
	yellow		4[ ]
5.4 (15)	**Plant: total length**		
	very short	Mator	1[ ]
	short	Toro	3[ ]
	medium	Adagio	5[ ]
	long	Siletta Nova	7[ ]
	very long		9[ ]
5.5 (23)	**Root: color**		
	white	Nemex	1[ ]
	red	Mator	2[ ]
	violet		3[ ]
	blackish brown		4[ ]

6. Similar varieties and differences from these varieties

Denomination of similar variety	Characteristic in which the similar variety is different [o)]	State of expression of similar variety	State of expression of candidate variety

o) In the case of identical states of expressions of both varieties, please indicate the size of the difference.

7. Additional information which may help to distinguish the variety

7.1 Resistance to pests and diseases

7.2 Special conditions for the examination of the variety

7.3 Other information

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