

Plant		Mulberry		454	Primary essential character	
No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Leaf size	/leaf/shoot/3 plants	Measurement	cm (round to the 1st decimal place)		Length of the largest leaf on the longest shoot in the late autumn silkworm-rearing season
2	Leaf lobation	/shoot/3 plants	Measurement	1:0 2:0-1 3:0-2 4:0-4 5:2 6:2-4 7:4 8:4-many 9:Many		Observation of leaves at about 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
3	Leaf thickness	/shoot/3 plants	Others	2:Very thin 3:Thin 4:Thin to Medium 5:Medium 6:Medium to Thick 7:Thick 8:Very thick		Determination by touching the leaves mentioned above. Microscopic observation should be performed, if necessary.
4	Tree form	/5 plants	Observation	3:Drooping 4:Descending 5:Procumbent 6:Slightly procumbent 7:Erect		Tree form in the late autumn silkworm-rearing season
5	Shoot length	/shoot/3 plants	Measurement	cm (integer)		Mean length of the longest shoots in the defoliation season
6	Number of shoots	/3 plants	Measurement	Number (round to the 1st decimal place)		Mean number of shoots in the defoliation season (except for dwarf shoots)
7	Shoot size	/shoot/3 plants	Measurement	cm (round to the 1st decimal place)		Diameter of shoot at about 10 cm above the bottom of the longest shoot in the defoliation season
8	Internode length	/shoot/3 plants	Measurement	cm (round to the 1st decimal place)		Measurement of the length of the distance between 10 internodes at around 1/3 distance below the top of the longest shoot in the defoliation season and then calculation of one internodal distance
9	Number of lateral shoots	/3 shoot/3 plants	Measurement	(round to the 1st decimal place)		Mean number of lateral shoots on the longest shoot in the defoliation season

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1	Phyllotaxis	/shoot/3 plants	Observation	3:1/2 4:1/3 5:2/5 6:3/8 7:5/13		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
2	Leaf angle	/shoot/3 plants	Observation	3:Obtuse 4:Slightly obtuse 5:Horizontal 6:Slightly acute 7:Acute		Angle of the leaf blade to the shoot. At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
3	Leaf shape	/shoot/3 plants	Observation	2:Orbicular 3:Elliptic 4:Ovate 5:Cordate 6:Pentagonal 7:Lanceolate 9:Pseudomorphic		Shape of unlobed leaf. At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
4	Leaf-tip shape	/shoot/3 plants	Observation	3:Emarginate 4:Obtuse 5:Acute 6:Acuminate 7:Caudate		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
5	Leaf-bottom shape	/shoot/3 plants	Observation	3:Cuneate 4:Truncate 5:Retuse 6:Cordate 7:Closed		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
6	Depth of leaf lobation	shoot/3 plants	Observation	2:Lobate 4:Medium 6:Cleft 8:Parted		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
7	Leaf serration	/shoot/3 plants	Observation	2:Repand 3:Crenate 4:Mucronate 5:Serrulate 6:Dentate 7:Double serrate 8:Aristate		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
8	Leaf color	/shoot/3 plants	Observation	3:Yellow 4:Yellowish green 5:Light green 6:Green 7:Dark green		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season

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9	Leaf gloss	/shoot/3 plants	Observation	1:None 3:Weak 4:Weak to Medium 5:Medium 6:Medium to Strong 7:Strong		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
10	Texture of leaf surface	/shoot/3 plants	Measurement	3:Smooth 5:Scabrous 7:Coarse		Touching the leaf surface. At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
11	Leaf wrinkle	/shoot/3 plants	Observation	1:No wrinkles 3:Few 4:Few to Medium 5:Medium 6:Medium to Many 7:Many 9:Very large number		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
12	Density of leaf trichome	/shoot/3 plants	Observation	1:Glabrous 2:Nearly glabrous 3:Sparse & short 4:Sparse & long 5:Downy 6:Dense & short 7:Dense & long 8:Pubescent 9:Highly pubescent		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
13	Petiole length	/3 leaves/shoot/3 plants	Measurement	mm (round to the 1st decimal place)		At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season
14	Petiole width	/3 leaves/shoot/3 plants	Measurement	mm (round to the 1st decimal place)		Width of the central part of the petiole. At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season.
15	Petiole thickness	/3 leaves/shoot/3 plants	Measurement	mm (round to the 1st decimal place)		Thickness of the central part of the petiole. At approximately 1/3 distance below the top of the longest shoot in the late autumn silkworm-rearing season.
16	Shape of petiole scar	/3 leaves/shoot/3 plants	Observation	2:Circular 4:Elliptic 6:Semi-circular 8:Triangular		At approximately 1/3 distance below from the top of the longest shoot in winter

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17	Curve of the shoot	/shoot/3 plants	Observation	2: Straight 4: Slight zigzag 6: Zigzag 8: Spiral		Observation of the longest shoot in the late-autumn silkworm rearing season
18	Shoot color	/shoot/3 plants	Observation	2: Light gray 3: Grayish brown 4: Greenish brown 5: Light brown 6: Brown 7: Reddish brown 8: Dark brown		Observation of the longest shoot in winter (December to February)
19	Texture of shoot surface	/shoot/3 plants	Measurement	3: Fine 4: Fine to Coarse 5: Coarse 6: Coarse to Scabrous 7: Scabrous		Determination by touching. At approximately 1/3 distance below the top of the longest shoot in winter (December to February)
20	Lenticel size	/shoot/3 plants	Observation	3: Small 4: Small to Medium 5: Medium 6: Medium to Large 7: Large		At approximately 1/3 distance below the top of the longest shoot in winter (December to February)
21	Lenticel density	/shoot/3 plants	Observation	3: Low 4: Low to Medium 5: Medium 6: Medium to High 7: High		At approximately 1/3 distance below the top of the longest shoot in winter (December to February)
22	Behavior of winter buds	/shoot/3 plants	Observation	3: Closed & erect 4: Closed & slanting 5: Intermediate & erect 6: Intermediate & slanting 7: Open & erect 8: Open & slanting		Observation of winter buds at approximately 1/3 distance below the top of the longest shoot in winter
23	Shape of winter buds	/shoot/3 plants	Observation	2: Obtuse angled triangular 4: Triangular 6: Acute angled triangular 8: Spindle shaped		Observation of winter buds at approximately 1/3 distance below the top of the longest shoot in winter
24	Size of winter buds	/shoot/3 plants	Observation	2: Very small 3: Small 4: Small to Medium 5: Medium 6: Medium to Large 7: Large 8: Very large		Observation of winter buds at approximately 1/3 distance below the top of the longest shoot in winter
25	Color of winter buds	/shoot/3 plants	Observation	2: Light gray 3: Grayish brown 4: Light brown 5: Brown 6: Reddish brown 7: Dark brown		Observation of winter buds (or scales) at approximately 1/3 distance below the top of the longest shoot in winter (December to February)

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26	Number of accessory buds	/shoot/3 plants	Measurement	Number/primary bud (round to the 1st decimal place)		Observation of accessory buds at approximately 1/3 distance below the top of the longest shoot in winter (December to February)
27	Sex expression	/shoot/3 plants	Observation	3:Staminate 4:Predominantly staminate 5:Hermaphrodite 6:Predominantly pistillate 7:Pistillate		Observation of flower-bearing shoots in the flowering season
28	Number of flower clusters	/3 buds/shoot/3 plants	Measurement	Number/primary bud (round to the 1st decimal place)		Investigation of flower-bearing shoots in the flowering season
29	Style length	/3 flowers/shoot/3 plants	Measurement	mm (round to the 1st decimal place)		Investigation of flowers in the middle part of flower-bearing shoots
30	Fruit length	/3 fruits/shoot/3 plants	Measurement	cm (round to the 1st decimal place)		Investigation of medium-sized fruits
31	Fruit shape	/3 fruits/shoot/3 plants	Observation	3:Cylindroidal 5:Ellipsoidal 7:Globose		Investigation of medium-sized fruits
32	Fruit color	/3 fruits/shoot/3 plants	Observation	2:Milky white 3:Yellow 4:Pink 5:Pale purple 6:Reddish purple 7:Dark purple 8:Black		Investigation of medium-sized fruits
33	Seed size	/20 seeds	Observation	3:Small 4:Small to Medium 5:Medium 6:Medium to Large 7:Large		
34	Seed shape	/20 seeds	Observation	3:Spheroidal 5:Ovoid 7:Triangular		
35	Seed color	/20 seeds	Observation	3:Light brown 5:Brown 7:Dark brown		
36	Chromosome number	3 replications	Measurement	(integer)		

Plant		Mulberry		454	Secondary essential character	
No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Sprouting date	/shoot/3 plants	Observation	date		Mean of sprouting dates of three putatively normal buds located at approximately 1/3 distance below the top of the longest shoot
2	Hardness of leaves	/shoot/3 plants	Observation	3:Very early 4:Early 5:Medium 6:Late 7:Very late		Observation of leaves which are located at approximately 1/3 distance below the top of the longest shoot in the late-autumn silkworm-rearing season. Determination by touching
3	Cold tolerance	/shoot/3 plants	Measurement	% (round to the 1st decimal place)		Ratio of the length of shoot tip injured with cold to the length of the longest shoot
4	Ratio of incidence of dwarf disease	/5 plants	Observation	% (integer)		Mean of ratio of the number of infected trees to total number of tested trees for three years
5	Resistance to bacterial blight	/5 plants	Observation	3:Low 4:Low to Medium 5:Medium 6:Medium to High 7:High		Observation in early to mid-July (low large amount of necrosis and curling, medium: between high and low, high: none or little necrosis)
6	Resistance to powdery mildew	/5 plants	Observation	3:Low 4:Low to Medium 5:Medium 6:Medium to High 7:High		Observation in the late-autumn silkworm-rearing season (low: most of leaf showing the symptoms, medium: between resistant and weak, high: none or little necrosis)

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1	Uniformity of sprouting	/shoot/3 plants	Observation	3:Low 5:Medium 7:High		Observation in spring. Difference between the earliest date and the latest date of sprouting of winter buds located at approximately 1/3 distance below the top of the longest shoot
2	Ratio of non-sprouting buds in spring-rearing season	/shoot/3 plants	Measurement	% (round to the 1st decimal place)		Ratio of non-sprouting buds to total buds on the longest shoot in spring
3	Length of sproutless part on the lower part of an old shoot	/shoot/3 plants	Measurement	% (round to the 1st decimal place)		Ratio of the length of sproutless portion at the lower part to full length of the longest shoot in spring
4	Development of new shoots	/shoot/3 plants	Observation	3:Weak 4:Weak to Medium 5:Medium 6:Medium to Vigorous 7:Vigorous		Observation of the buds located approximately 1/3 distance below the top of the longest shoot
5	Sprouting ability after intermediate cutting	3 shoots/3 plants	Measurement	3:Weak 4:Weak to Medium 5:Medium 6:Medium to Vigorous 7:Vigorous		About one month after cutting shoots back to the middle of the shoot in mid-July, counting of the number of shoots newly developed on the old moderate-growing shoots. (weak: none or less than one, medium: one to three, vigorous: more than three)
6	Ease of leaf-stripping	/shoots/3 plants	Measurement	3:Difficult 4:Difficult to Medium 5:Medium 6:Medium to Easy 7:Easy		Determination by stripping leaves off in the summer-autumn-rearing season
7	Stiffening and defoliation of leaves in the lower part of shoot	/shoots/3 plants	Measurement	% (round to the 1st decimal place)		Ratio of the length of leafless portion in the lower part of shoot to the full length of the longest shoot in the late autumn-rearing season
8	Lodging resistance	/5 plants	Observation	3:Low 4:Low to Medium 5:Medium 6:Medium to High 7:High		Resistance to lodging of shoots due to rainstorms in summer-autumn-rearing season

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9	Rooting ability	/10 cuttings	Measurement	% (round to the 1st decimal place)		Preparation of cuttings from the basal part of 10 old shoots collected before sprouting season, immersion of the lower parts in 5 cm of water overnight, then planting the cuttings into a nursery mulched by polyethylene film
10	Resistance to die-back	/5 plants	Observation	3:Low 4:Low to Medium 5:Medium 6:Medium to High 7:High		Observation at the 5th larva-stage in the spring-rearing season (high: no symptoms on the shoot or no decrease of yield, low: decrease of more than 50 % of yield due to death or infection, medium: between high and low)
11	Resistance to rust	/5 plants	Observation	3:Low 4:Low to Medium 5:Medium 6:Medium to High 7:High		Observation in the spring and summer-autumn-rearing seasons. (high: very few or no symptoms, low: symptoms in 1/3 part of whole leaf, medium: between high and low)
12	Resistance to twig blight	/5 plants	Obs.&Mearr.	3:Low 4:Low to Medium 5:Medium 6:Medium to High 7:High		Observation of the shoots in spring, which grew after intermediate cutting in the previous year (high: little or no damage, low: decrease of more than 50 % of yield, medium: between high and low)

Plant		Mulberry		454	Tertiary essential character	
No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Weight of mulberry shoots in spring rearing season	/3 plants	Measurement	kg/plant (round to the 1st decimal place)		In the spring-rearing season, cutting at the base of the shoots which were cut back to half of their length in the late autumn-rearing season in the previous year and measurement of their weight
2	Ratio of new shoots in spring-rearing season	/3 plants	Measurement	% (round to the 1st decimal place)		Collection of shoots newly developed on the previous-year's shoots, measurement their weight and calculation of the ratio of new shoots to total weight of shoots
3	Weight of mulberry shoots in late autumn-rearing season	/3 plants	Measurement	kg/plant (round to the 1st decimal place)		In the late autumn-rearing season, cutting back the shoots grown after the cutting in the spring rearing season to half of their length and weigh the shoots cut off
4	Leaf weight ratio in late-autumn rearing season	/3 plants	Measurement	% (round to the 1st decimal place)		Collection of leaves from shoots which were cut off according to the above method and calculation of the ratio of the weight of leaves to that of the shoots
5	Total yield per year	/3 plants	Measurement	kg/plant (round to the 1st decimal place)		Sum of yield of new shoots in spring-rearing season and leaves in late autumn-rearing season

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No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Nutrient value (nitrogen content)	/3 plants	Measurement	% (round to the 1st decimal place)		Collection of leaves at around 1/3 distance below the top of shoots in summer and determination of the nitrogen content by the semi-micro Kjeldahl method
2	Sugar content of fruit	/3 fruits/shoot/3 plants	Measurement	Brix % (round to the 1st decimal place)		Measurement of medium-sized fruits using refractometer