Plant	Apple	483	Primary essential character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Color of dormant one-year-old shoot	10 shoots	Observation	1:Green 2:Grey 3:Brown 4:Reddish brown	Observe the over color of the central portion of moderate 1-year-old dormant shoots
2	Leaf size	15 leaves	Measurement	square cm (integer)	Measure lengths (L) and widths (W) of leaf blade of 15 leaves collected from 4th to 6th node of moderate growing shoots in August and calculate leaf area by pi x L x W /4.0
3	Leaf shape	15 leaves	Measurement	* (integer)	Evaluate length/width ratio of leaf blade by L/W x 100
4	Shape of serration	15 leaves	Observation	0:Entire 1:Crenate 2:Serrate 3:Biserrate	Observe the incision of margin of the central portion of leaf blade
5	Pubescence on mature leaf	15 leaves	Observation	0:Absent 3:Scarce 5:Intermediate 7:Dense	Observe the pubescence on the reverse side of leaves
6	Stipule shape	15 leaves	Observation	1:Round 2:Intermediate 3:Long round 4:Sickle-shaped	Observe the shape of stipule of leaves
7	Flower size	10 flowers	Measurement	mm (integer)	Measure the longest diameter of 10 flowers of full opening
8	Fruit size	10 fruits	Measurement	g (integer)	Average weight of 10 normal ripe fruits
9	Fruit shape	10 fruits	Observation	1:Globose 2:Conical 3:Flat 4:Short-globose-conical 5:Oblong 6:Long-conical	Observe the shape of samples used for fruit size
10	Over color of fruit skin	10 fruits	Observation	1:Red 2:Reddish purple 3:Yellow 4:Green	Observe the pigmentation on the skin of samples used for fruit size

Plant	Apple	483	Primary optional character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Lobation	15 leaves	Observation	0:Absent 9:Present	Observe the lobation of 15 leaves collected from 4th to 6th nodes on 5 moderate growing shoots in August
2	Petiole/leaf ratio	15 leaves	Measurement	* (integer)	Calculate (petiole length)/(leaf blade length) x 100

Plant	Apple	483	Secondary essential character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Date of sprouting	2 trees	Measurement	date	Observe the date when more than 3 terminal buds have sprouted in a tree
2	Date of full bloom	2 trees	Measurement	date	Observe the date when 70-80% of terminal flowers opened
3	Date of maturity	2 trees	Measurement	date	Observe the date when the largest amount of fruits were harvested
4	Degree of russetting on fruit skin	10 fruits	Observation	0:Absent 1:Almost absent 3:Few 5:Intermediate 7:Much 9:Very much	Classify the degree of russetting on fruit skin
5	Resistance to Alternaria blotch	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge from infection ratio and degree of disease caused by Alternaria mali
6	Resistance to ceder apple rust	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge from infection ratio and degree of disease caused by Gymndsporangium yamadae
7	Resistance to scab	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge from infection ratio and degree of disease caused by Venturia inaequalis
8	Resistance to aphids	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge from damage by aphids
9	Physiological drop of young fruit (June drop)	2 trees	Observation	0:None 3:Few 5:Intermediate 7:Many	Observe the degree of June drop
10	Preharvest drop	2 trees	Observation	0:None 3:Few 5:Intermediate 7:Many	Observe the degree of fruit drop at maturity
11	Bitter pit	2 trees	Observation	0:None 3:Low 5:Intermediate 7:High	Observe the incidence of bitter pit of fruits
12	Internal breakdown	10 fruits	Observation	0:None 3:Low 5:Intermediate 7:High	Observe the incidence of internal breakdown of fruits
13	Cork spot	2 trees	Observation	0:None 3:Low 5:Intermediate 7:High	Observe the incidence of cork spot of fruits

Plant	Apple	483	Secondary optional character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Tree habit	2 trees	Observation	1:Fastigiate 3:Upright 5:Spreading 7:Weeping	Judge by the general shape and growth characteristics of trees
2	Tree vigor	2 trees	Observation	3:Weak 5:Intermediate 7:Strong	Judge by the tree size and growth characteristics of current shoots
3	Spur formation	2 trees	Observation	3:Few 5:Intermediate 7:Many	Observe the spur formation on 2-year-old shoots
4	Amount of pollen	10 flowers	Observation	0:Absent 9:Present	Observe the amount of pollens at flowering time
5	Uniformity of fruits	10 fruits	Observation	3:Poor 5:Intermediate 7:Good	Observe the uniformity of fruit size and shape
6	Ground color of fruit skin	10 fruits	Observation	1:Yellow 2:Yellowish green 3:Green	Observe the ground color of fruit skin at maturity
7	Position of russetting on fruit skin	10 fruits	Observation	1:Around eye basin 2:Around stalk cavity 3:On cheeks 4:Entire skin	Observe the position of russetting on fruit skin
8	Russetting of dot	10 fruits	Observation	0:Absent 9:Present	Observe the russetting of dot on fruit skin
9	Bloom on fruit skin	10 fruits	Observation	0:Absent 9:Present	Observe the amount of white powdery on fruit skin
10	Color of flesh	5 fruits	Observation	1:White 2:Yellow 3:Greenish white	Observe the flesh color immediately after cut
11	Resistance to powdery mildew	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge by infection ratio and degree of occurrence caused by Podosphaera leucotricha
12	Resistance to fruit spot	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge by infection ratio and degree of occurrence caused by Mycosphaerella pomi
13	Resistance to internal bark necrosis	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge the occurrence of physiological internal bark necrosis after dipping cut shoots in manganese solution or by the observation of the symptoms in the field

Plant	Apple	483	Secondary optional character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
14	Resistance to wooly apple aphid	2 trees	Observation	1:Resistant 3:Moderately resistant 5:Moderately susceptible 7:Highly susceptible	Judge by infection ratio and degree of occurrence caused by Eriosoma lanigerum

Plant	Apple	483	Tertiary essential character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Firmness of fruit	10 fruits	Measurement	lb (round to the 1st decimal place)	Measure flesh firmness using a penetrometer with a plunger 7/16 inch in diameter. Measurement is taken at the center of the opposite cheeks of each fruit after removing a disc of peel about 1 cm in diameter
2	Soluble solids content	10 fruits	Measurement	% (round to the 1st decimal place)	Measure the filtrate of juice squeezed from 10 fruits with a refractometer
3	Titratable acidity	10 fruits	Measurement	g/100 ml (round to the 3rd decimal place)	Take out 5 ml filtrate of juice from 10 fruits and fill up to 50 ml. Titrate by 1/10 N NaOH and convert to the amount of malic acid (Malic acid g/100 ml=0.134 fx,f:factor,x:titration volume)
4	Texture of flesh	5 fruits	Sensory	3:Fine 5:Intermediate 7:Coarse	Evaluate the texture of flesh by chewing
5	Juiciness	5 fruits	Sensory	3:Low 5:Intermediate 7:High	Evaluate the fruit juiciness by chewing
6	Watercore	5 fruits	Observation	0:Absent 3:Little 5:Intermediate 7:Much	Observe the water core of full mature fruits at harvest
7	Mealy breakdown	5 fruits	Sensory	3:High 5:Intermediate 7:Low	Evaluate the texture of flour in a mass periodically by chewing flesh after storage
8	Greasiness of skin	10 fruits	Observation	3:Low 5:Intermediate 7:High	Observe the occurrence of greasiness on fruit skin periodically at maturity and after storage
9	Storability of fruits under room temperature	20 fruits	Others	days (integer)	Evaluate the maximum storage period under room temperature by the change of flavor and firmness of fruits
10	Yield	2 trees	Measurement	kg/tree (round to the 1st decimal place)	Measure the yield per tree at high productive age

Plant	Apple	483	Tertiary optional character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Astringency	5 fruits	Sensory	0:Absent 3:Weak 5:Intermediate 7:Strong	Evaluate the amount of astringency by chewing fruits
2	Aroma	5 fruits	Sensory	3:Weak 5:Intermediate 7:Strong	Evaluate the amount of aroma by chewing fruits
3	Occurrence of core breakdown	10 fruits	Observation	0:Absent 3:Little 5:Intermediate 7:Much	Observe the degree of fungi occurrence and rot caused by Fusarium, Altanaria and others
4	Storability of fruits under low temperature	20 fruits	Measurement	days (integer)	Evaluate the maximum storage period in a refrigerator (2-5 C) by the change of flavor and fruit firmness
5	Occurrence of scald	10 fruits	Observation	0:Absent 3:Little 5:Intermediate 7:Much	Observe the degree of incidence of scald after storage