Plant	Wheat	473	Primary essential character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Plant habit	Block	Observation	2:Erect 3:Nearly-erect 4:Semi-erect 5:Intermediate 6:Semi-prostrate 7:Nearly-prostrate 8:Prostrate	Plant type before the initiation of internode elongation (January to February). In the district of long snow cover, growth habit is observed before snow cover.
2	Culm length	10 plants	Measurement	cm (integer)	Length from ground level to the ear neck of the longest culm
3	Ear length	10 plants	Measurement	cm (round to the 1st decimal place)	Length from ear neck to the top of ear of the longest culm
4	Existence of awn	Block	Observation	0:Awnless 2:Very scarce 3:Scarce 4:Slightly scarce 5:Intermediate 6:Slightly abundant 7:Abundant 8:Very abundant	Scarce=10%, intermediate=25%, abundant=40%
5	Glume color	Block	Observation	1:Light yellow 2:Yellow 3:Yellowish brown 4:Brown 5:Reddish brown 6:Red 7:Reddish purple 8:Purple 9:Dark purple	Glume color at maturity
6	Grain size	Block	Observation	2:Very small 3:Small 4:Slightly small 5:Intermediate 6:Slightly large 7:Large 8:Very large	Grade of grain size
7	Grain color	Block	Observation	0:White 1:Light yellow 2:Yellow 3:Yellwish brown 4:Brown 5:Reddish brown 6:Red 7:Reddish purple 8:Purple 9:Dark purple	Color of grain
8	Heading time	Block	Observation	date	Date when 40-50% ears of available stems have emerged
9	Maturity date	Block	Observation	date	Date when color at ear neck in more than 80% of total ears turns yellow and grains become as hard as wax.

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No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Culm angle	Block	Observation	2:Very close 3:Close 4:Slightly close 5:Intermediate 6:Slightly open 7:Open 8:Very open	Culm angle at the full heading time to maturity. Open type shows a large angle
2	Leaf sheath color	Block	Observation	0:Absent 9:Present	Presense of anthocyanin in leaf sheath at the emergence of seedlings
3	Culm thickness	Block	Observation	2:Very thin 3:Thin 4:Slightly thin 5:Intermediate 6:Slightly thick 7:Thick 8:Very thick	Thickness of culm at maturity
4	Culm stiffness	Block	Observation	2:Very stiff 3:Stiff 4:Slightly stiff 5:Intermediate 6:Slightly soft 7:Soft 8:Very soft	Stiffness of culm at maturity
5	Culm waxiness	Block	Observation	0:Absent 2:Almost none 3:Very little 4:Little 5:Intermediate 6:Some 7:Much 8:Very much	Degree of culm waxiness on the upper first internode at heading time
6	Leaf color	Block	Observation	2:Very light 3:Light green 4:Slightly light 5:Green 6:Slightly dark 7:Dark green 8:Very dark	Leaf color at tillering stage and booting stage or at observation time of growth habit
7	Leaf sheath waxiness	Block	Observation	0:Absent 2:Almost none 3:Very little 4:Little 5:Intermediate 6:Some 7:Much 8:Very much	Degree of waxiness on the upper first leaf sheath at heading time
8	Leaf sheath pubescence	Block	Observation	0:Absent 2:Almost none 3:Very little 4:Little 5:Intermediate 6:Some 7:Much 8:Very much	Degree of leaf sheath pubescence
9	Leaf blade angle	Block	Observation	0:Absent 2:Very small 3:Small 4:Slightly small 5:Intermediate 6:Slightly large 7:Large 8:Very large	Degree of nutant in leaf at the full heading time
10	Leaf flecking	Block	Observation	0:Absent 2:Almost none 3:Very little 4:Little 5:Intermediate 6:Some 7:Much 8:Very much	Degree of light yellow spots on leaves at the full heading time
11	Spike shape	Block	Observation	1:Drill form 2:Drill form-Fusiform 3:Fusiform 4:Fusiform-Oblong 5:Oblong 6:Oblong-Clavate 7:Clavate 8:Clavate-Elliptical 9:Elliptical	Classification of spike shape

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No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
12	Spikelet density	10 spikes	Obs.&Measr.	2:Very sparse 3:Sparse 4:Slightly sparse 5:Intermediate 6:Slightly dense 7:Dense 8:Very dense	Number of internodes in rachis (=number of total spikelets - 1)/rachis length(cm)
13	Ear protrusion	5 spikes	Measurement	2:Very short 3:Short 4:Slightly short 5:Intermediate 6:Slightly long 7:Long 8:Very long	Distance from the tip of flag leaf sheath to spike neck at maturity
14	Spike waxiness	Block	Observation	0:Absent 2:Almost none 3:Very little 4:Little 5:Intermediate 6:Some 7:Much 8:Very much	Degree of spike waxiness at the full heading time
15	Awn length	10 spikes	Obs.&Measr.	2:Very short 3:Short 4:Slightly short 5:Intermediate 6:Slightly long 7:Long 8:Very long	Measurement of the longest 10 awns, and/or comparison with standard cultivars
16	Glume pubescence	Block	Observation	0:Absent 9:Present	Glume pubescence at the full heading time
17	Anther color	Block	Observation	2:Yellow 8:Purple 9:Others	Observation of anther color at anthesis
18	Grain shape	Block	Obs.&Measr.	2:Very round 3:Round 4:Slightly oval 5:Oval 6:Slightly slender 7:Slender 8:Very slender	Evaluation based on the ratio of length to width of grain
19	Size of brush area of grain	Block	Observation	2:Very small 3:Small 4:Slightly small 5:Intermediate 6:Slightly large 7:Large 8:Very large	

Plant	Wheat	473	Secondary essential character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Grade of spring habit	10 plants	Obs.&Measr.	1:1 2:2 3:3 4:4 5:5 6:6 7:7	Observe heading performance after seeds are sown at a constant interval (usually 10 days) from February to April. Accessions with high spring habit are classified as 1, and with high winter habit is clasified as 7.
2	Spring wheat or winter wheat	Block	Observation	2:Spring type 8:Winter type	Classify by grade of spring habit
3	Sprouting resistance	5 ears	Measurement	2:Very difficult 3:Difficult 4:Slightly difficult 5:Intermediate 6:Slightly easy 7:Easy 8:Very easy	Sprouting of maturing ears under wet conditions
4	Threshability	Block	Observation	2:Very difficult 3:Difficult 4:Slightly difficult 5:Intermediate 6:Slightly easy 7:Easy 8:Very easy	Investigation of easiness or difficulty for threshing at maturity
5	Lodging resistance	Block	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Synthetic judgment based on the stage of lodging occurrence and degree of lodging
6	Yellow mosaic resistance	10 plants, 2 replications	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Judge by disease symptom around internode elongation stage and uniformity of heading (middle and southern parts of Japan)
7	Scab resistance	30 plants, 4 replications	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Judge by the degree of disease infection at dough ripe stage to maturity
8	Powdery mildew resistance	50 plants, 2 replications	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Judge by the degree and extension of disease symptom at ripening stage
9	Leaf rust resistance	10 plants, 2 replications	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Judge by the degree and extension of symptom at ripening stage or infection type in seedling

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No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
10	Stem rust resistance	Block	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Judge by the degree and extension of disease symptom at ripening stage (northern part of Japan)

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No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Time of internode elogation	Block	Observation	2:Very early 3:Early 4:Slightly early 5:Intermediate 6:Slightly late 7:Late 8:Very late	Observation of internode elongation from the end of January to the beginning of April (central and southern parts of Japan)
2	Presense, absense or degree of black point grain	Block	Obs.&Measr.	0:Absent 2:Almost none 3:Very little 4:Little 5:Intermediate 6:Some 7:Much 8:Very much	Presense of black points on embryo and endosperm
3	Cold tolerance	100 plants, 2 replications	Obs.&Measr.	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Judgment by the rate of winter-killing and the degree of damage after overwintering (northern part of Japan)
4	Tolerance to moisture	Block	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Tolerance to excessive moisture (note observation stage)
5	Snow mold tolerance	Block	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Judgment by the degree of plant damage after snow melting (snow falling area)
6	Tolerance to soil upheaval	40 plants, 4 replications	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Tolerance to upheaval against frozen soil. Synthetic judgment by the rate of surviving plants at two investigation times
7	Resistance to insect pests	Block	Observation	2:Very high 3:High 4:Slightly high 5:Intermediate 6:Slightly low 7:Low 8:Very low	Note insect name
8	Cytoplasmic male sterility gene	Block	Others	0:Absent 9:Present	
9	Restorer gene	Block	Others	0:Absent 9:Present	

Plant	Wheat	473	Tertiary essential character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Potential yield	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Comparison of weight of whole-grains per area with a standard cultivar
2	1000 grain weight	3 replications	Measurement	2:Very light 3:Light 4:Slightly light 5:Intermediate 6:Slightly heavy 7:Heavy 8:Very heavy	Conversion to 1000 grain weight after counting of grains with 20 gram samples (grain moisture 12.5%)
3	Test weight	3 replications	Measurement	2:Very light 3:Light 4:Slightly light 5:Intermediate 6:Slightly heavy 7:Heavy 8:Very heavy	Weight of volume in 1 liter (grain moisture content 12.5%). Measurement more than 2 times using liter weight vessel.
4	Grain quality	Block	Observation	1:Excellent 2:Very good 3:Good 4:Slightly good 5:Intermediate 6:Slightly poor 7:Poor 8:Very poor 9:Extremely poor	Comprehensive synthetic judgment of appearance of grain based on fullness, uniform of size and shape, bright color of grains
5	Grain hardness	Block	Obs.&Measr.	2:Very soft 3:Soft 4:Slightly soft 5:Intermediate 6:Slightly hard 7:Hard 8:Very hard	Quantity of hard starch granule. Judge by BM ratio or microscopic observation
6	Glossiness of grain	Block	Observation	3:Powdery 4:Slightly powdery 5:Intermediate 6:Slightly glossy 7:Glossy	Measurement of percentage of glossy kernels. Powdery:<=30% glossy, intermediate:=30-70% glossy, glassy:>=70% glossy
7	Crude protein content of 60% flour	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Total nitrogen % in 60% flour x 5.70

Plant	Wheat	473	Tertiary optional character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
1	Flour yield	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	(Flour weight/weight of flour and bran) x 100
2	Milling score	Block	Calculation	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	100- ((80 - flour yield) + 50 x (total ash - 0.30))
3	Whiteness of flour	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Classify by reflection rate of 60% flour in 455 micro meter wave(R455) using a microspectoroscopy
4	Brightness of flour	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Classify by reflection rate of 60% flour in 554 micro meter wave(R554) using a microspectoroscopy
5	Yellowness of flour	Block	Calculation	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Calculate by log R455 - log R554, description in D455 - D554 of 60% flour
6	Water absorption rate	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Classify by rate of water quantity necessary to raise dough strength to 500 B.U. by Farinograph
7	Valorimeter value	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Dough property evaluated by figure of farinogram
8	Dough fermentation quality	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Dough strength evaluated by the figure of extensogram after dough fermentation of 135 minutes storage
9	Resistance to extension in extensogram	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Dough extension evaluated by the height in the figure of extensogram after dough fermentation at 135 minutes storage
10	Extensibility in extensogram	Block	Measurement	2:Very short 3:Short 4:Slightly short 5:Intermediate 6:Slightly long 7:Long 8:Very long	Dough extensibility evaluated by the base length in the figure of extensogram after dough fermentation at 135 minutes storage

Plant	Wheat	473	Tertiary optional character

No	Characters	No. of samples	Methods	Rank or measurement unit	Remarks
11	Coefficient in extensogram	Block	Calculation	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Resistance to extension in extensogram(R) / extensibility in extensogram(E)
12	Maximum viscosity	Block	Measurement	2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high	Degree of amylose activity in wheat flour measured by Amylograph