

Plant		Perennial ryegrass		457	Primary essential character	
No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Plant type	10 plants, 2 replications	Observation	1:Erect 2:Nearly erect 3:Semi-erect 4:Slightly semi-erect 5:Intermediate 6:Slightly intermediate 7:Semi-prostrate 8:Nearly prostrate 9:Prostrate		Angle that outer main stems make with the horizontal at internode elongation to heading time
2	Plant height	10 plants, 2 replications	Measurement	cm (integer)		Length from the ground to the tip of plant at heading time or at the first cutting
3	Spike length	10 plants, 2 replications	Measurement	cm (round to the 1st decimal place)		Length from the neck node to the tip of spike
4	Leaf length	10 plants, 2 replications	Measurement	cm (round to the 1st decimal place)		Length of the first leaf below flag leaf
5	Leaf width	10 plants, 2 replications	Measurement	mm (round to the 1st decimal place)		Width of the widest part of the first leaf below flag leaf
6	Date of first heading	10 plants, 2 replications	Observation	date		Average date when the first head of each plant has emerged
7	Stem thickness	10 plants, 2 replications	Obs.&Mear.	1:Extremely thin 2:Very thin 3:Thin 4:Slightly thin 5:Intermediate 6:Slightly thick 7:Thick 8:Very thick 9:Extremely thick		Long diameter of the internode just below the neck node of the spike of the longest stem at the full heading stage or at the first cutting
8	Number of stems	10 plants, 2 replications	Observation	1:Almost none 2:Extremely few 3:Very few 4:Few 5:Intermediate 6:Some 7:Many 8:Very many 9:Extremely many		Number of stems at heading stage or at the first cutting
9	Number of spikes	10 plants, 2 replications	Observation	0:Absent 1:Almost none 2:Extremely few 3:Very few 4:Few 5:Intermediate 6:Some 7:Many 8:Very many 9:Extremely many		Number of spikes at the full heading stage or at the first cutting

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No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Culm length	10 plants, 2 replications	Measurement	cm (integer)		Culm length of main stem from the ground to the neck node of spike at heading stage
2	Leaf color	10 plants, 2 replications	Observation	1:Extremely light green 2:Very light green 3:Light green 4:Slightly light green 5:Intermediate 6:Slightly dark green 7:Dark green 8:Very dark green 9:Extremely dark green		Greenness of leaf blade at heading stage
3	Anthocyanin pigmentation of seedlings	10 plants, 2 replications	Observation	1:Extremely light 2:Very light 3:Light 4:Slightly light 5:Intermediate 6:Slightly dark 7:Dark 8:Very dark 9:Extremely dark		Anthocyanin pigmentation of the stem base before overwintering
4	Anthocyanin pigmentation of mature plants	10 plants, 2 replications	Observation	1:Extremely light 2:Very light 3:Light 4:Slightly light 5:Intermediate 6:Slightly dark 7:Dark 8:Very dark 9:Extremely dark		Anthocyanin pigmentation of the node at the beginning of heading to the full heading stage
5	Ratio of heading stems	10 plants, 2 replications	Observation	0:None 1:Extremely low 2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Ratio of heading stems to the total number of stems regenerated after cutting
6	Heading in autumn	10 plants, 2 replications	Observation	0:None 1:Extremely little 2:Very little 3:Little 4:Slightly little 5:Intermediate 6:Some 7:Much 8:Very much 9:Most		Number of spikes from regenerated tillers in autumn
7	Leaf texture	10 plants, 2 replications	Measurement	1:Extremely tender 2:Very tender 3:Tender 4:Slightly tender 5:Intermediate 6:Slightly rough 7:Rough 8:Very rough 9:Extremely rough		Texture of leaf blade determined by touch at heading time
8	Weight of 1000 seeds	10 plants, 2 replications	Measurement	g (round to the 2nd decimal place)		Weight of 1000 seeds estimated by sampling 100 seeds from a mixture of total 20 plants (10 plants with 2 replications) with 4 replications
9	Weight of 20 spikes	10 plants, 2 replications	Measurement	g (round to the 1st decimal place)		Dry weight of 20 spikes

Plant		Perennial ryegrass		457	Secondary essential character	
No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Crown rust resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Resistance to Puccinia coronata. Judging from the infection which is made by artificial inoculation or in an infected field
2	Net blotch resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Resistance to Drechslera dictyoides. Judging from the degree of the infection by inoculation or planting in an infected field
3	Regrowth	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Degree of regrowth two weeks after the first cutting in spring
4	Plant vigor in autumn	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Amount of growth in autumn
5	Summer survival	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Tolerance to summer depression. Judging from ratio of dead plants and stems and plant vigor in early autumn
6	Overwintering ability	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Overwintering ability. Judging from ratio of dead plants and stems and injury of leaves in early spring

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1	Brown patch resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Rather low 5:Intermediate 6:Rather high 7:High 8:Very high 9:Extremely high		Resistance to Rhizoctonia solani. Judging from the damage
2	Leaf blight resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Rather low 5:Intermediate 6:Rather high 7:High 8:Very high 9:Extremely high		Resistance to Drechslera siccans. Judging from degree of lesioning and the dead portion of leaves
3	Halo blight resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Rather low 5:Intermediate 6:Rather high 7:High 8:Very high 9:Extremely high		Resistance to Pseudomonas syringae. Judging from degree of lesioning and the dead portion of leaves
4	Snow blight resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Rather low 5:Intermediate 6:Rather high 7:High 8:Very high 9:Extremely high		Resistance to snow mold diseases. Judging from ratio of dead plants and the damage in leaves and stems after overwintering in a heavy snow area
5	Tolerance to snow cover	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Rather low 5:Intermediate 6:Rather high 7:High 8:Very high 9:Extremely high		Overwintering ability. Judging from ratio of dead plants and stems and the dead portion of leaves 10 to 15 days after snow melted in a heavy snow area
6	Ergot resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Rather low 5:Intermediate 6:Rather high 7:High 8:Very high 9:Extremely high		Resistance to Claviceps purpurea. Judging from number of ergots borne on spikes
7	Blast resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Rather low 5:Intermediate 6:Rather high 7:High 8:Very high 9:Extremely high		Resistance to Pyricularia grisea. Judging from the infection which is made by artificial inoculation or in an infected field
8	Plant vigor in spring	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Amount of regrowth 2 weeks after sprouting in early spring
9	Spring habit	10 plants, 2 replications	Observation	0:None 1:Extremely low 2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Percentage of heading plants when sown in spring (none:0% - extremely high:100%)

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10	Lodging resistance	10 plants, 2 replications	Observation	1:Extremely low 2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high	Degree of lodging resistance at heading stage of the first cutting

Plant		Perennial ryegrass		457	Tertiary essential character	
No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Green yield in spring	2 plots	Measurement	kg/a (integer)		Fresh yield harvested from an area of 2 square meters of the 6 square meter plot at each cutting in spring
2	Dry matter ratio in spring	2 plots	Measurement	% (round to the 1st decimal place)		Rate of dry matter of 300 to 500 g of fresh sample dried at 70 centi degree for 48 hours in spring
3	Dry matter yield in spring	2 plots	Calculation	kg/a (integer)		Fresh weight x dry matter ratio/100 in spring
4	Green yield in summer	2 plots	Measurement	kg/a (integer)		Fresh weight harvested from at least from 2 square meter area in the 6 square meter plot at each cutting in summer
5	Dry matter ratio in summer	2 plots	Measurement	% (round to the 1st decimal place)		Ratio of dry matter of 300 to 500 g of fresh sample dried at 70 centi degree for 48 hours in summer
6	Dry matter yield in summer	2 plots	Calculation	kg/a (integer)		Fresh weight x dry matter ratio/100 in summer
7	Green yield in autumn	2 plots	Measurement	kg/a (integer)		Fresh weight harvested from at least from 2 square meter area in the 6 square meter plot at each cutting in autumn
8	Dry matter ratio in autumn	2 plots	Measurement	% (round to the 1st decimal place)		Ratio of dry matter of 300 to 500 g of fresh sample dried at 70 centi degrees for 48 hours in autumn
9	Dry matter yield in autumn	2 plots	Calculation	kg/a (integer)		Fresh weight x dry matter ratio/100 in autumn

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1	Dry matter digestibility	2 plots, 2 replications	Measurement	% (round to the 1st decimal place)		Ratio of digestible dry matter on dry matter base by in vitro enzyme method or near infrared spectroscopy (NIRS)
2	Crude protein content	2 plots, 2 replications	Measurement	% (round to the 1st decimal place)		Ratio of crude protein content on dry matter base by Kjeldahl method or near infrared spectroscopy (NIRS)
3	Acid detergent fiber (ADF)	2 plots, 2 replications	Measurement	% (round to the 1st decimal place)		Ratio of ADF content on dry matter base by acid detergent-acetone washing
4	Neutral detergent fiber (NDF)	2 plots, 2 replications	Measurement	% (round to the 1st decimal place)		Ratio of NDF content on dry matter base by neutral detergent-acetone washing
5	Acid detergent lignin (ADL)	2 plots, 2 replications	Measurement	% (round to the 1st decimal place)		Ratio of ADL content on dry matter base by acid detergent-acetone washing
6	Mono-and oligosaccharides	2 plots, 2 replications	Measurement	% (round to the 1st decimal place)		Ratio of mono and oligosaccharides content on dry matter base by ethanol extraction and phenol sulfuric acid method
7	Persistency	2 plots, 2 replications	Obs.&Mear.	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Rate of survival and soil coverage 3 to 4 years after sowing
8	Suitability for grazing	2 plots, 2 replications	Obs.&Mear.	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Comprehensive estimation of grazing suitability by soil coverage, intake, yield, etc. under conditions
9	Acceptability	2 plots, 2 replications	Obs.&Mear.	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly good 7:Good 8:Very good 9:Excellent		Comprehensive estimation of intake by rate of amount taken time required for intake, intensity of intake under grazing
10	Seed productivity	2 plots, 2 replications	Measurement	g/square meter (integer)		Weight of cleaned seed per square meter

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11	Seed weight per spike	2 plots, 2 replications	Measurement	g/spike (round to the 1st decimal place)		Pure seed weight per spike averaged from 20 normal spikes
12	Seed fertility	2 plots, 2 replications	Measurement	% (integer)		Rate of seed fertility estimated by number of seeds cleaned/number of seeds harvested x 100 using 10 normal spikes