

Plant		Italian ryegrass		456	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 stems make with the horizontal observed at full heading time
2	Culm length	10 plants, 2 replications	Measurement	cm (integer)		Length from the ground to the neck node of spike of the main stem at the full heading stage
3	Spike length	10 plants, 2 replications	Measurement	cm (round to the 1st decimal place)		Length from the neck node of spike to the tip of spike (excluding awn)
4	Stem thickness	10 plants, 2 replications	Measurement	mm (round to the 1st decimal place)		Diameter of the internode just below the neck node of spike
5	Leaf length	10 plants, 2 replications	Measurement	cm (round to the 1st decimal place)		Length of the first leaf below flag leaf
6	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
7	Date of first heading	10 plants, 2 replications	Observation	date		Date when 50% of productive stems have headed
8	Ploidy	10 plants, 2 replications	Observation	1:Diploid 3:Tetraploid		Judging from observation or the cytological methods

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1	Plant length at early stage	10 plants, 2 replications	Measurement	cm (integer)		Longest length from the ground to the tip of leaf before overwintering
2	Plant length in early spring	10 plants, 2 replications	Measurement	cm (integer)		Plant height from the ground to the leaf tip of plant in early spring or 30 days after snow disappeared
3	Number of spikes	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:Abundant		Number of spikes at the full heading stage
4	Leaf color	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		Greenness of leaf blades at vegetative growth phase
5	Plant height	10 plants, 2 replications	Observation	1:Extremely short 2:Very short 3:Short 4:Slightly short 5:Intermediate 6:Slightly tall 7:Tall 8:Very tall 9:Extremely tall		Natural height at internode elongation stage to early boot stage
6	Number of spikelets	10 plants, 2 replications	Measurement	Spikelets/spike (integer)		Counting spikelets of 1-2 spikes per plant
7	Anthocyanin pigmentation at early stage	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
8	Anthocyanin pigmentation of mature plant	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 a node from the beginning to the full heading time
9	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
10	Presence of awn and its length	10 plants, 2 replications	Measurement	mm (round to the 1st decimal place)		Lengths of the 2 longest floret awns on the upper spike of each plant are measured

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11	Fluorescence reaction	100 seeds	Measurement	% (round to the 1st decimal place)		Rate of seeding root fluorescence among 25 seeds 18 days after placing in the dark for 16 hours at 20 centi degrees or for 8 hours at 30 centi degrees
12	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 the full heading stage
13	Plant width	10 plants, 2 replications	Obs.&Mear.	1:Extremely narrow 2:Very narrow 3:Narrow 4:Slightly narrow 5:Intermediate 6:Slightly wide 7:Wide 8:Very wide 9:Extremely wide		Plant width at internode elongation stage after vernalization. Judging from observation or measuring length + width

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No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Brown 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	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
3	Growing period	10 plants, 2 replications	Observation	1:Extremely short 2:Very short 3:Short 4:Slightly short 5:Intermediate 6:Slightly long 7:Long 8:Very long 9:Extremely long		Survival rate observed in early summer
4	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		Regrowth one to two weeks after the first cutting

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1	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 infection when it is apparent
2	Halo blight 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 Pseudomonas syringae. Judging from the infection when it is apparent
3	Brown patch 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 Rhizoctonia solani. Judging from the infection when it is apparent
4	Blast 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 Pyricularia grisea. Judging from the infection when it is apparent
5	Snow blight 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 snow mold diseases. Judging from the infection when it is apparent
6	Ergot 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 Claviceps purpurea. Judging from the infection when it is apparent
7	Leaf blight 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 siccans. Judging from the infection when it is apparent
8	Spring habit	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		Ratio of heading plants when seeded in spring
9	Cold hardiness	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Overwintering ability. Judging from winter damage under low snowfall conditions
10	Tolerance to heavy snow cover	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Overwintering ability under heavy snow cover when observed 10 to 15 days after melting of snow
11	Summer survival	10 plants, 2 replications	Observation	1:Extremely poor 2:Very poor 3:Poor 4:Slightly poor 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Rate of summer survivals and plant vigor in early autumn

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12	Male sterility	10 plants, 2 replications	Observation	1:Fertile 3:Partial male sterile 5:Male sterile		The rate of male sterile individuals. Judging from the dehiscence of anthers. If male sterile rate is 5 to 90%, it is defined as partial male sterile, and when male sterile rate is more than 95%, it is defined as male sterile

Plant		Italian ryegrass		456	Tertiary essential character	
No	Characters	No. of samples	Methods	Rank or measurement unit		Remarks
1	Fresh yield of first harvest	2 plots	Measurement	kg/a (round to the 1st decimal place)		Fresh yield harvested from an area of more than 2 square meters at the first cutting
2	Dry matter rate of first harvest	2 plots	Measurement	% (round to the 1st decimal place)		Ratio of dry matter of 500 g fresh sample dried at 70 centi degrees for 48 hours at the first cutting
3	Dry matter yield of first harvest	2 plots	Calculation	kg/a (integer)		Fresh weight x dry matter rate / 100, at the first cutting
4	Green yield of regrowth	2 plots	Measurement	kg/a (round to the 1st decimal place)		Fresh regrowth weight harvested at least from the 2nd plant after the first cutting
5	Dry matter rate of regrowth	2 plots	Measurement	% (round to the 1st decimal place)		Rate of regrowth dry matter of 500 g fresh sample dried at 70 centi degrees for 48 hours after the first cutting
6	Dry matter yield of regrowth	2 plots	Calculation	kg/a (integer)		Fresh regrowth weight x dry matter rate / 100, after the first cutting

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1	Dry matter digestibility	2 plots, 3 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, 3 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	2 plots, 3 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	2 plots, 3 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	2 plots, 3 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, 3 replications	Measurement	% (round to the 1st decimal place)		Ratio of mono and oligosaccharides content on dry matter base by ethanol extraction and thin layer chromatography
7	Nitrate nitrogen concentration	2 plots, 3 replications	Obs.&Mear.	1:Extremely low 2:Very low 3:Low 4:Slightly low 5:Intermediate 6:Slightly high 7:High 8:Very high 9:Extremely high		Based on the method according to the "the quality evaluation guidebook of forage crop (version 3)"
8	Seed yield	2 plots, 2 replications	Measurement	g/ (round to the 1st decimal place)		Weight of cleaned seed harvested from an area of more than 1 square meter