

Evaluation of Characteristics for Selection of Useful Genotypes in *Polygala tenuifolia* willd.

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Abstract

Polygala tenuifolia Willd. is a perennial plant that grows wild in central and northern Korea and China. It is known as a medicinal herb that helps to treat cognitive disorders and improve memory. It's consumption has recently increased as a herbal medicine, but it is entirely dependent on imports. Therefore, it is necessary to develop standard varieties by collecting genetic resources for import substitution and uniform quality. This study was conducted to evaluate for characteristics of the collected genetic resources and to select useful genotypes. A total of 26 germplasm were collected at domestic and abroad, and they were classified into 11 types according to morphological characteristics, such as leaf morphology and stem branching type. Above ground part (Plant height, stem diameter, branch number, shoot dry weight) and under ground part (root length, root diameter, sub root number, root dry weight) of collected genotypes were characterized. Leaf morphology and stem branching type was divided into 4 group, thin leaf-unbranched type, thin leaf-few branched type, thin leaf-multi branched type, broad leaf-multi branched type. Plant height of examined genotypes range from 18.6cm to 28.3cm, root length vary from 15.3cm to 25.6cm, root dry weight range from 1.2g to w.2.7g per plant, and polygala saponin B contents of tested accessions range from 0.17% to 0.33%. Root dry weight of PT3, PT5 and PT8 genotypes were relatively heavier than that of others. The content of polygala saponim B of the PT4 genotype was the highest at 0.37%. According to the above results, it was possible to select genotypes with a high yield of root and high content of polygala saponim B. Further breeding programs will address the development of standard cultivars utilizing the collected genotypes to combine desirable traits such as high yields and highly useful ingredients.

Meterials & Methods

The experiment was conducted at the National Institute of Horticultural & Herbal Science in Eumseong, Korea. Eleven genotypes were planted open field after growing the seedlings for about 2 months in the greenhouse. Plant height, branch number, root length, sub root number and dry weight were measured in growing periods and harvest time. To analyze the content of polygala saponin contained in the polygala root, 20 mg of dried polygala root powder was added with 1 mL of 100% methanol and ultrasonically extracted for 30 minutes, the extract was centrifuged at 1200 rpm for 10 minutes, and the supernatant was filtered with a syringe filter. Analysis was performed under the conditions specified in Table 1.

Table 1. HPLC analysis conditions for polygala saponin B.

HPLC	Agilent Txchnologies 1100series
Column	INNO Column C18 (4.6mm x 250mm, 5μm
Wavelength	307nm
Column temperature	25°C
Mobile phase	Solvent A - Water(+0.1% phosphoric Acid Solvent B - Acetonitrile
Flowrate	1ml/min
Gradient conditions	0.0 min solvent B 35% 40.0 min solvent B 50%



Fig 2. Leaf morphology and stem branching type of *Polygala tenuifolia*.
(A): thin leaf-unbranched type, (B): thin leaf-few branched type,
(C): thin leaf-multi branched type, (D): broad leaf-multi branched type

Table 2. Growth characteristics by genotypes of *P. tenuifolia*.

Lines	Plant height (cm)	Stem diameter (mm)	Branch number	Root length (cm)	Root diameter (mm)	Sub root number	Dry weight (g)	
							Shoot	Root
PT 1	26.4±0.84	3.9±0.11	25.3±1.10	22.1±0.59	3.8±0.07	4.7±0.57	6.5±0.24	1.7±0.08
PT 2	23.5±0.62	3.7±0.06	21.3±0.86	21.2±0.57	3.3±0.08	2.3±0.42	9.3±0.28	1.8±0.08
PT 3	28.3±0.42	5.0±0.28	21.7±0.79	18.9±0.55	4.5±0.21	4.0±0.27	12.5±1.34	2.7±0.28
PT 4	17.0±0.25	3.4±0.23	14.3±0.57	15.3±0.28	2.5±0.11	0.7±0.31	4.5±0.14	1.2±0.08
PT 5	27.9±0.80	4.9±0.08	23.0±1.79	25.6±1.23	4.0±0.04	0.7±0.31	10.3±0.48	2.3±0.08
PT 6	19.6±0.32	3.8±0.19	23.0±3.56	17.7±0.08	2.9±0.08	0.7±0.31	6.7±0.64	1.2±0.08
PT 7	17.3±0.48	4.0±0.10	29.7±0.96	23.5±0.41	3.4±0.05	1.0±0.47	7.8±0.21	1.7±0.21
PT 8	19.0±0.27	3.4±0.05	33.0±2.45	21.3±0.44	2.3±0.05	2.3±0.18	4.2±0.08	2.3±0.63
PT 9	20.0±0.79	3.8±0.14	34.3±3.55	23.1±0.97	3.1±0.07	1.0±0.00	7.8±0.57	1.7±0.08
PT 10	18.6±0.25	2.9±0.11	33.7±1.34	17.2±0.42	2.3±0.02	1.0±0.00	3.5±0.14	0.8±0.08
PT 11	24.2±0.24	3.9±0.05	30.3±0.31	20.1±0.22	3.1±0.03	1.3±0.16	5.7±0.21	1.2±0.08

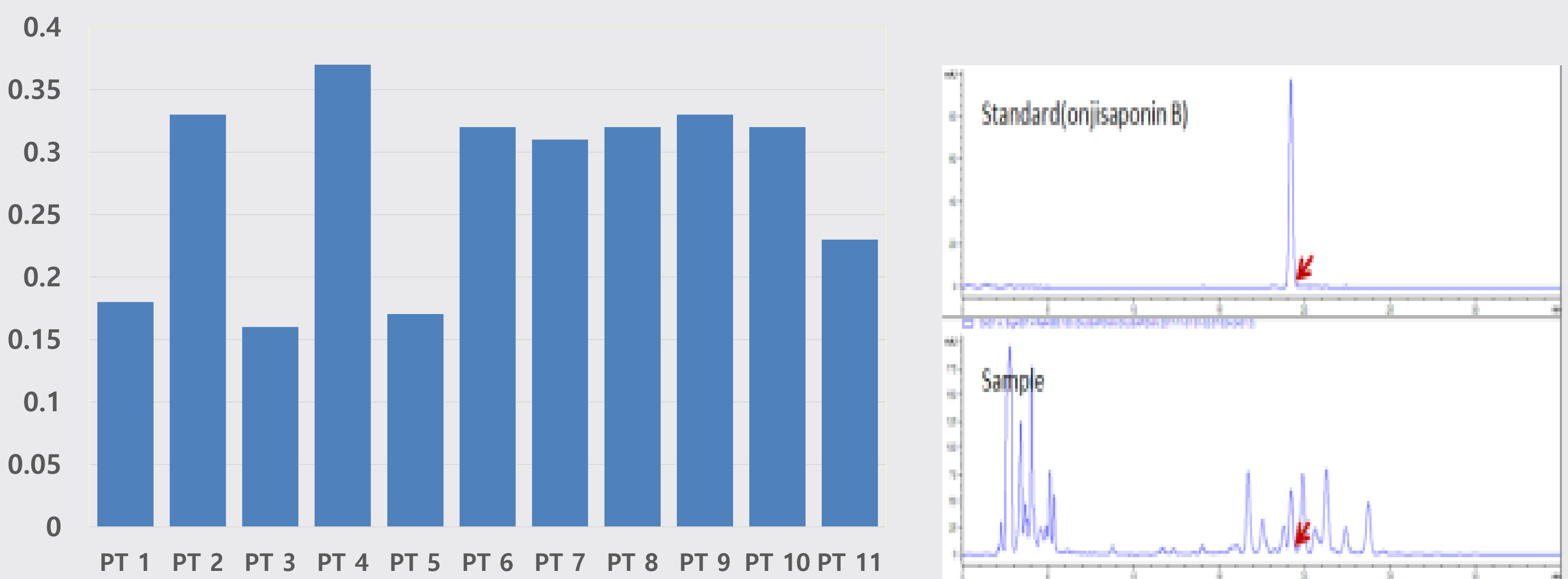


Fig 3. polygala saponin B contents by genotypes of *P. tenuifolia*.

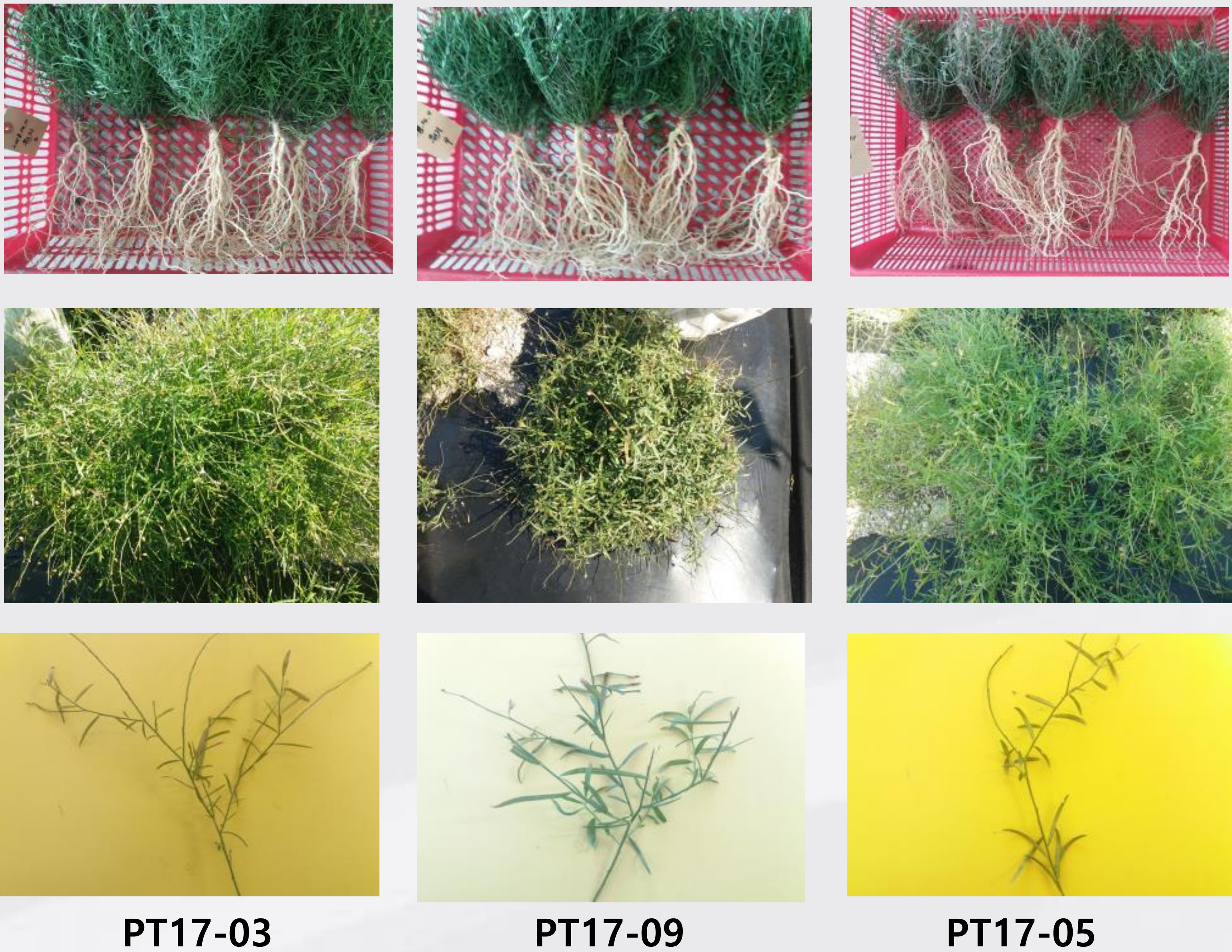


Fig 4. Growth characteristics of the selected genotypes.

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