Division Method of Several Morphological Characteristics for Classification of Potato Germplasm

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Abstract The indices of morphological characteristics for classification of potato germplasm are selected and standardized by investigation of the morphological differences of plant type, stem, leaf, flower, fruit and sprout.

Key words potato, morphological characteristic, standardization

Introduction

The great leader Comrade **Kim Il Sung** said as follows.

"The University should investigate the country's natural resources. It should conduct proper research for rational utilization of the resources."("**KIM IL SUNG** WORKS" Vol. 7 P. 131)

Under the deepening of research for potato germplasm management in many countries, the peculiar potato germplasm management systems have been established and the research on standardization of classification method of potato varieties are being carried out in order to realize the effective exchange of potato germplasm and its information [1].

But there are some inconveniences in exchange and collection of potato germplasm because of the remarkable differences in ecological conditions, potato cultivation condition, retention of potato germplasm and level of research, according to each country in germplasm classification indices and method [3－5].

We have studied on selection and standardization of the division indices according to morphological characteristics using the conserved potato germplasm in our country.

1. Materials and Methods

1.1. Materials

In the study more than 400 varieties among local varieties which are conserved in our country were used.

1.2. Methods

1.2.1. Cultivation method

The experimental fields are situated in the high region (Jangjin County) and low region (Pyongyang) and the morphological characteristics were investigated comparatively between high and low lands.

The seed potato was sprouted until 2～5mm of sprouts length under 15～20℃ of temperature and 500～1 000lx of light intensity, and specially until 2～5cm of sprouts length for the seed potato

which were used in investigation of sprouts.

The planting density were 20 plants per pyong, the numbers of investigation were 100 plants.[3]

1.2.2. Observation methods

For the plant height of potato germplasm it was measured in two ways: length from the surface of land to bottom of the floral axis of the most height stem in a plant at the opening of florescence for the florescent varieties, length from the surface of land to the top overlapping petal node in a plant for the other varieties.

The number of stem per plant was counted using the calculation of number of main stems that have grown directly from seed potato at the opening of florescence, number of branches was counted using the calculation of number of branches that have grown from main stems, and the thickness of stem measured bottom diameter of the main stem.

The plant type measured the angles between the ground and stems at the florescence and in special for the groundling varieties it investigated according to the front or back of leaves.

And change of the plant type was investigated until the harvesting season.

Color of the stems was investigated by the observation of main color, different size spots and patterns color using the hand lens.

The leaf type was observed by watching the difference of leaflets distribution and number of folioles in an overlapping petal between the varieties.

The florescence was investigated by the calculation of florescence percentage of investigated plants, color and shape of flower (corolla, stigma, anther, pedicel and calyxes) were investigated using naked eye and hand lens.

In the first step color and shape of tuber were investigated immediately after the harvesting and we selected the 5～10 typical tubers, investigated their color using naked eye and hand lens and investigated the shape by measuring length, large, thickness, their proportion and remarkable shape.[2]

2. Results and Discussion

2.1. The indices of morphological characteristics of plant

3rd class–erect (Angle between ground and stems is about 90°)

5th class–semi-erect (Angle between ground and stems is $45～90^{\circ}$)

7th class–spread (Angle between ground and stems is below 45°)

2.2. The indices of morphological characteristics of stem

Shape of stem wing

1–straight, 2–wave, 3–saw tooth

Shape of transverse section

1–trilateral, 2–quadrilateral, 3–polygon, 4–cylindrical

Color of stem

G–green, Br–brown, P–purple, 7P–deep purple

2.3. The indices of morphological characteristics of leaf

Color of leaf

3G–verdant green, G–green, 7G–deep green

Leaf glossiness

1st class–rough

2nd class–polish

3rd class–good polish

Leaf margin

1–wave, 2–billows, 3–slender

Leaf pubescence

1–sleek, 3–clear–cut, 5–trichoma, 7–pile

Leaflet distribution

3rd class–sparse

5th class–compact

7th class–good compact

Shape of terminal leaflet

1–narrow, 2–large, 3–long oval, 4–egg type, 5–reversal egg type, 6–ampelopsis

Stipule shape

1–sickle, 2–dichotomy, 3–phyllome

2.4. The indices of morphological characteristics of flower

Corolla shape

1–radial, 2–pentagon, 3–analogous oval

Corolla size

3rd class–small (Diameter of corolla is below 2cm)

5th class–middle (Diameter of corolla is 2.0～3cm)

7th class–big (Diameter of corolla is above 3cm)

Corolla color

W–white, 3R–pink, R–red, RP–reddish purple, P–purple, BP–bluish purple, B–blue, Y–yellow

Stipule color

G–green, RP–reddish purple

Overlapping petal

0–nonexistence, +–existence

Color of pedicel node

0–nonexistence (Color of pedicel node is similar to that of pedicel)

+–existence (Color of pedicel node is different to that of pedicel)

Florescence

1st class–fig (Florescence percentage of investigated plants is 0%)

3rd class–few florescence (Florescence percentage of investigated plants is below 25%)

5th class–usual florescence (Florescence percentage of investigated plants is 25～75%)

7th class–good florescence (Florescence percentage of investigated plants is above 75%)

Stigma shape

0–non forked, 1–forked in two part, 2–forked in three part

Stigma color

3G–verdant green, G–green, 7G–deep green

Stigma length

1st class–short (Length of stigma is similar with that of anther)

5th class–middle (Top of stigma is exposed)

7th class–long (All part of stigma is exposed)

Anther shape

1–cylinder, 2–sledge, 3–deformity

Anther color

Y–yellow, O–orange, YG–yellowish green, 3G–verdant green

2.5. The indices of morphological characteristics of tuber

Tuber shape

1–flat and oval, 2–oval, 3–egg type, 4–reversal egg type, 5–flat and long oval, 6–long oval, 7–oblong, 8–cylinder, 9–bludgeon, 10–wedge, 11–heart, 12–shuttle, 13–hook, 14–spiral, 15–palm, 16–accordion, 17–bumpy

Color of tuber skin

IW–lactescence, 3Y–yellowish white, Y–yellow, BR–brown, 3R–pink, R–red, 7R–deep red, P–purple, 7P–deep purple, RBr–reddish brown, Dr–reddish variegation, Dbkb–dark bluish variegation

Flesh color

W–white, IW–lactescence, 3Y–yellowish white, Y–yellow, 7Y–deep yellow, O–orange, R–red, 3RBr–light reddish brown, RBr–reddish brown, BKRBr–dark reddish brown, sR–red spot

2.6. The indices of morphological characteristics of sprout

Shape of bottom

1–oval, 2–long oval, 3–circular cone, 4–large column, 5–narrow column

Color of bottom

G–green, 3P–light purple, P–purple, 7P–deep purple, 3Br–light brown, Br–brown, 7Br–deep brown

Shape of top

1st class–crowd

2nd class–middle

3rd class–forked

Sprout color

G–green, 3G–light green, R–red, 7R–deep red, 3P–light purple, 7P–deep purple, Br–brown, B–bluish brown

Pubescence in bottom of sprout

1–sleek, 3–clear cut, 5–trichomy, 7–pile

Shoot depth

3rd　class–shallow($\leqq$0.1cm)

5th　class–middle　(0.1～0.2cm)

7th　class–deep($>$0.2cm)

Shoot color

0–nonexistence (Color of shoot is similar to that of tuber skin)

+–existence (Color of shoot is different to that of tuber skin)

Number of shoot

3rd　class–few (Number of shoot per tuber is below 7)

5th　class–middle (Number of shoot per tuber is 7～12)

7th　class–abundant (Number of shoot per tuber is above 12)

2.7. Discussion

The indices of morphological characteristics of potato are proper ones to potato varieties and they can be used in the main indices for the classification of potato germplasm.

The indices of morphological characteristics of potato and their codes have been selected and standardized in order to distinguish the different varieties in germplasm management and seed potato production, therefore, its compatibility and convenience are ensured in international exchange of potato germplasm and its information.

Conclusion

1) By the investigation for several morphological characteristics of potato germplasm and their differences according to varieties, the characteristics division indices which can be used to distinguish the germplasm were selected.

2) More than 400 varieties have been classified using the several morphological characteristics of potato and their codes and the management system of potato germplasm was established.

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