# Comparative Chemical Composition among the Varieties of Korean Chili Pepper

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## ABSTRACT

**From the point of breeding view for our future, 20 Korean varieties of red pepper for the contents of capsaicinoids, free amino acids, free fatty acids and organic acids with powder product and eating qualities were chosen, and the sensory properties of their water and ethanol extract were compared in order to investigate the influence of the composition of test components on sensory acceptability of Korean red pepper. The composition of taste components in red pepper powder varied wildly depending on the varieties; total capsaicinoids content variety from 0.029 to 0.913%, free sugar 8.45 to 20.2%, and organic acid 4.58 to 19.54%. Capsaicinoid contents especially dihydrocapsaicin content, were highly correlated with pungent taste of the methanol extract of red pepper power, but did not show significant relationship to the overall sensory acceptability. However, the components analyzed here and eating and processing qualities include high variations and future breeding sources.**

***Keywords*** **:** Sugars composition, organic acids, amino acids, fatty acids, capsaicin, red pepper

## INTRODUCTION

Peppers, chilies, capsicum are nutritionally important and versatile vegetables, and spicy materials in the world. Chile pepper is a very important crop in Asian countries, especially in Korean and surrounding countries.

Chemical compositions of peppers effected to considerable properties with pungency. These compositions determine the cooking menu and tastes, reflects the preference and favorite. Peppers are good for high vitamin C, vitamin A, capsaicin and sugar sources. (Bosland and Votava, 2000). Generally, bell pepper types contain 20% of the dry weigh of pericarp tissue, 77% fibrous material, 400 mg/100 g, 16-17% protein, vitamin C 200 mg/100 g, beta-carotene (more than 90% is provitamin A) with high content of capsaicin. Total sugar contains 4.2 g/100 g (Shogakkan,

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1995) and soluble sugar is higher than 10% by Brix analysis (Yagishita *et al.*, 1992). Today, peppers are very important vegetables and medicinal crops for isolation of the functional substances.

We cultivated the 20 Korean varieties of chili peppers, elucidated those fruit chemical compositions, and evaluated fruit powder taste and fruit quality. Researches on the chemical compositions and fruit qualities has not poorly understood (Kim *et al.*, 1997; Maoka *et al.*, 2001; Kumio, 1997)

## MATERIALS AND METHODS

### Plant materials

Chili pepper cultivars (*Capsicum annuum*) were obtained from Dong Won Nongsan Seed Co. (Korea). They planted and grew in the field in March, and the ripened fruits were harvested during June-August 1999. Because pepper varieties were indeterminate plant growth, five times harvestings were performed. At each harvesting 1 Kg of fruits was collected. Each variety sample was homogenized using a pestle and mortar, and samples were served for extraction and determination of necessary components according to the corresponding methods (Bildinmeyer *et al.*, 1984; Hamilton and Cwik, 1997; Khaleque *et al.*, 1991). Morphological fruit characters measurements were performed for human sensitivity test according to eating and standard organoleptic pungency score test.

### Analysis of the components

Compositions from the fruits were analyzed by conventional methods. The ethanol soluble free sugars were obtained from 85% ethanol extract for overnight and measured by HPLC. HPLC conditions were as follows; column was the type, High Performance Carbohydrate Column (4.6 cm×250 mm, Waters Co.), column temperature, 35C, detection, Reflactice index (Water Model 410), mobile phase, 75% acetonitrile, flow rate, 1.2 ml/min. The contents of free sugars were measured by the comparison of standards using the millennium program (Waters Co.). To obtain free organic acids, the 1 g sample was extracted with 80% ethanol (10 ml) and purified by Amberlite IRC-50 column. The obtained free organic acids were further analyzed by HPLC under the conditions as follows; column, Supelco gel C-610 (7.8×30 mm, Supelco Co.), detection, UV 219 nm (Waters Model 486); mobile phase, 0.1% phosphoric acid, flow rate 0.5 ml/min. The content of free organic acids was measured as previously described. The free amino acids and fatty acids were analyzed by Pico-Tag method and modified Folch method, respectively. The contents of capsaicinoids of red pepper powders were measured by HPLC analysis after acetone extraction. HPLC conditions were as follows; column, Symmetric Column (3.9×150 mm, 5 cm, Waters Co.), detection, UV 280nm (Waters Model 480), mobile phase, 65% acetonitrile, flow rate, 0.8 ml/min. Dry fruit characters were measured for pericarp, placenta and seed. Other fruit size, no of seeds and powdered characters were also measured and estimated.

## RESULTS AND DISCUSSION

### Free sugars

All of Korean red peppers contain high amount of fructose and glucose and a small or trance amount of trehalose, inositol, sucrose, galactose, xylose and glycerol. Two sugars, fructose and glucose are main sugars, in rare cases, sucrose and trehalose are contained. Especially, 2 varieties, HP 110-111 contained higher amount of sucrose, with trehalose, but those compositions do not directory reflect to the powder taste (Table 1 and Table 5). However, those two cultivars are important special genetic resource for high sugar lines. Sweet cultivars, HP 113-114 had high contents of fructose plus glucose with good fruit

Table 1. The contents of free sugars of Korean red peppers

| No. of sample | Cultivar | Content of free sugars (mg/g, dry matter) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Glycerol | Xylose | Fructose | Glucose | Galactose | Sucrose | Innositol | Trehalose |
| 101 | Kim chi | 1.6 | 2.6 | 83.1 | 46.4 | - | - | 1.5 | 1.8 |
| 102 | Cho hung | 1.3 | 1.2 | 61.4 | 19.9 | 3.7 | - | - | 1.4 |
| 103 | Da jo a | - | 1.1 | 49.6 | 12. | 1.5 | - | - | 2.8 |
| 104 | Muck ge ri | - | 1.4 | 62.1 | 25.3 | - | - | - | 1.6 |
| 105 | Po chung chun | - | 1.5 | 69.5 | 30.3 | - | - | - | 1.4 |
| 106 | Ma ni da | - | 1.3 | 64.3 | 18.1 | - | - | - | 2.0 |
| 107 | Bu kang | - | 2.0 | 80.5 | 36.6 | - | - | - | 1.0 |
| 108 | Dae myeng | - | 1.5 | 83.0 | 32.7 | - | - | - | 3.8 |
| 109 | Hong tap 2 | - | 2.1 | 57.6 | 18.4 | - | - | - | - |
| 110 | Pd-1 | - | - | 86.2 | 34.0 | - | 25.4 | - | 8.7 |
| 111 | Pd-2 | - | - | 70.8 | 45.6 | - | 22.4 | - | 14.8 |
| 112 | 510247 | - | 1.6 | 68.0 | 31.0 | - | - | - | - |
| 113 | 510332 | - | 1.4 | 90.0 | 34.5 | - | - | - | - |
| 114 | 510348 | - | 1.9 | 81.3 | 47.9 | - | - | - | - |
| 115 | 463811 | - | 1.7 | 81.6 | 39.6 | - | - | - | - |
| 116 | 4509722 | - | 2.0 | 78.7 | 39.3 | - | - | 1.1 | - |
| 117 | 4508094 | - | 1.3 | 53.4 | 17.3 | - | - | - | - |
| 118 | 4508095 | - | 1.3 | 50.8 | 9.5 | - | - | - | - |
| 119 | 463942 | - | 1.8 | 76.9 | 36.3 | - | - | - | - |
| 120 | Chinoyo chilli | - | | 137.9 | N. A[2] | - | - | - | 14.5 |

qualities. Especially HP 110 may reflect to deep taste combined soluble sugars such as sucrose, fructose and glucose with citric acid, acidicity. The selected lines further contained variable fructose and glucose contents than standard 'Chim Chi' and 'Da Joa' showing future source for breeding.

**Organic acids**

The Table 2 shows the contents of organic acids found in samples of red peppers. HP 110 line had high citric acid content, reflecting to more acid taste. High tartaric acid is not recommended. The other major differences were not drastically observed in the samples, which presented the highest contents in maleic, lactic and formic acids. Among the organic acids, tartaric and phylogulatamic acids were found just in some varieties of red peppers. However, the taste evaluation is not sufficient only for the free organic acids.

**Amino acids**

The contents of free amino acids of the samples were shown in Table 3. All samples were composed of mainly aspartic acid, serine, arginine, alanine, formic and proline.

Good taste lines or cultivars contained small amount

Table 2. The contents of free organic acids of Korean red peppers

| No. of sample | Cultivar | Content of organic acids (㎍/g, dry matter) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Citric | Tartaric | Malic | Lactic | Formic | Pyloglutamic |
| 101 | Kim chi | 5.4 | 141.7 | 108.0 | 48.0 | 266.0 | - |
| 102 | Cho hung | 11.6 | - | 79.1 | 38.4 | 91.1 | - |
| 103 | Da jo a | - | - | 48.1 | - | 99.3 | - |
| 104 | Muck ge ri | 19.0 | 5.0 | 165.9 | 112.7 | 238.3 | - |
| 105 | Po chung chun | 20.6 | - | 94.1 | 50.5 | 145.5 | - |
| 106 | Ma ni da | 28.9 | - | 198.2 | 44.4 | 143.5 | - |
| 107 | Bu kang | - | - | 136.2 | - | 159.3 | - |
| 108 | Dae myeng | 24.2 | - | 200.1 | 52.7 | 268.2 | - |
| 109 | Hong tap 2 | - | - | 150.8 | 60.9 | 188.6 | 9.9 |
| 110 | Pd-1 | 135.6 | - | - | 45.5 | - | - |
| 111 | Pd-2 | 11.5 | - | 52.6 | 59.8 | - | - |
| 112 | 510247 | 25.3 | 1122.8 | 235.0 | 34.0 | - | 9.7 |
| 113 | 510332 | 16.8 | - | 184.5 | 295.7 | - | 10.2 |
| 114 | 510348 | 40.4 | - | 282.8 | 89.7 | - | 9.7 |
| 115 | 463811 | 16.2 | - | 142.0 | 288.9 | - | - |
| 116 | 4509722 | 9.9 | - | 83.7 | 50.2 | 111.5 | - |
| 117 | 4508094 | 17.4 | - | 136.3 | 77.7 | 165.1 | - |
| 118 | 4508095 | 12.7 | - | 129.1 | 77.3 | 143.0 | - |
| 119 | 463942 | 22.0 | - | 95.6 | 38.3 | 149.4 | - |
| 120 | Chinoyo chilli | 17.3 | - | 18.7 | - | - | - |

of amino acids with good balance except for high amount of aspartic acid. This nature is similar to 'Da Joa' and 'Chim Chi'.

**Fatty acids**

The fatty acid composition of total lipid of the 20 lines and cultivars was measured, showing the similarity in the samples (Table 4).

The samples, the major fatty acids are C16:0, C18:2 and C18:. Good taste lines and cultivars may contain high C18:1 and C18:2 (and C18:3) group as 'Chim Chi' and Hp 107, Hp113-114. However, still characterization experiment will be necessary with fruit and powder production.

**Capsaicin**

Capsaicin ($C_{18}H_{27}NO_3$) is one of the major hot and medicinal components studied well in red peppers. It is used not only as one of flavoring agents, but also as a repeuted medicinal substances.

To breed the varieties and lines with good qualities, the contents of capsaicinoids were investigated by HPLC. The contents of capsaicinoids were shown in Table 5. All samples contained the capsaicinoids. The major capsaicinoids contained were capsaicin, dihydrocapsaicin and nordehydrocapsaicin and the

Table 3. The contents of free amino acids of Korean red peppers

| No. of sample | Cultivar | Contents of free amino acids (umole/g, dry matter) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Asp | Glu | Ser | Gly | His | Arg | Thr | Ala | Pro | Tyr | Val | Met | Cys | Ile | Leu | Phe | Lys |
| 101 | Kim chi | - | 31.9 | 7.3 | 2.6 | 2.3 | 16.6 | 2.5 | 13.0 | 22.4 | 1.0 | 3.7 | 0.2 | 0.5 | 1.2 | 1.9 | 1.2 | - |
| 102 | Cho hung | - | - | 1.8 | 4.3 | 2.5 | 19.8 | 4.2 | 8.2 | 19.3 | 1.0 | 4.0 | 0.4 | 0.5 | 1.8 | 2.3 | 2.0 | 0.2 |
| 103 | Da jo a | 40.4 | 10.4 | 2.2 | 5.2 | 3.0 | 26.9 | 4.8 | 12.0 | 20.5 | 0.8 | 4.7 | 0.4 | 0.5 | 1.7 | 2.4 | 1.2 | 1.2 |
| 104 | Muck ge ri | - | 29.4 | 38.6 | 37 | 1.6 | 12.2 | 2.4 | 9.7 | 26.6 | 0.6 | 3.2 | 0.4 | 1.0 | 1.4 | 2.0 | 1.7 | - |
| 105 | Po chung chun | 37.1 | - | 42.5 | 2.5 | 1.6 | 12.4 | 2.5 | 12.0 | 16.3 | 0.6 | 3.2 | 0.2 | 0.4 | 1.0 | 1.9 | 0.8 | - |
| 106 | Ma ni da | 45.2 | 12.1 | 46.8 | 4.7 | 1.7 | 14.5 | 3.2 | 12.2 | 39.5 | 0.8 | 4.0 | 0.5 | 0.1 | 1.9 | 2.6 | 1.9 | 0.2 |
| 107 | Bu kang | - | - | 6.6 | 3.6 | 1.4 | 13.3 | 2.2 | 12.4 | 22.2 | 1.8 | 33.7 | 0.5 | 1.2 | 1.8 | 1.8 | 1.7 | 0.2 |
| 108 | Dae myeng | 41.4 | 11.5 | 36.7 | 4.8 | 2.2 | 12.7 | 2.6 | 13.3 | 30.4 | 1.1 | 3.4 | 0.4 | 1.1 | 1.6 | 2.3 | 1.7 | 0.0 |
| 109 | Hong tap 2 | 46.6 | 11.9 | 14.6 | 9.6 | 2.9 | 18.5 | 5.4 | 20.3 | 12.5 | 1.2 | 5.3 | 0.6 | 0.8 | 1.8 | 2.3 | 1.7 | 0.7 |
| 110 | Pd-1 | 1.4 | 1.6 | 21.7 | 149.4 | 2.4 | 25.3 | 4.9 | 4.3 | 73.0 | 0.6 | 2.8 | 1.0 | 0.4 | 1.1 | 1.4 | 1.6 | 1.8 |
| 111 | Pd-2 | 1.6 | 1.3 | 5.6 | 6.7 | 1.9 | 8.8 | 2.2 | 2.2 | 92.6 | 0.4 | 1.4 | 0.2 | 0.4 | 0.2 | 1.0 | 0.4 | - |
| 112 | 510247 | 43.6 | 11.3 | 12.1 | 3.7 | 1.9 | 13.6 | 3.4 | 416.7 | 9.6 | 1.2 | 4.3 | 0.5 | 0.5 | 1.4 | 1.9 | 1.4 | 0.4 |
| 113 | 510332 | 43.9 | 10.2 | 36.5 | 3.5 | 1.8 | 16.2 | 3.1 | 15.1 | 4.6 | 0.7 | 3.2 | 1.1 | 0.5 | 1.1 | 1.8 | 1.1 | 0.2 |
| 114 | 510348 | 41.9 | - | 32.5 | 2.5 | 2.0 | 9.6 | 1.9 | 11.6 | 8.6 | 0.6 | 2.9 | 0.6 | 0.5 | 1.0 | 1.6 | 1.2 | - |
| 115 | 463811 | 31.7 | 7.8 | 6.8 | 3.8 | 2.6 | 10.7 | 2.5 | 13.6 | 8.9 | 2.3 | 1.5 | 1.1 | 0.8 | 1.3 | 2.5 | 2.0 | 0.2 |
| 116 | 4509722 | 36.0 | - | 8.4 | 2.8 | 1.6 | 9.8 | 1.8 | 11. | 8.4 | 0.8 | 3.4 | 0.8 | 0.8 | 1.1 | 1.7 | 1.2 | - |
| 117 | 4508094 | 41.4 | 9.7 | 12.6 | 4.3 | 1.8 | 11.3 | 2.9 | 12.1 | 8.4 | 1.1 | 4.0 | 0.4 | 0.5 | 1.2 | 1.8 | 1.4 | - |
| 118 | 4508095 | 48.2 | 12.1 | 16.4 | 6.2 | 3.2 | 16.2 | 4.9 | 14.5 | 11.2 | 1.4 | 5.4 | 1.0 | 0.4 | 1.8 | 2.3 | 2.3 | 0.4 |
| 119 | 463942 | 26.6 | 8.0 | 2.4 | 3.4 | 1.9 | 12.2 | 3.0 | 12.5 | 4.2 | 1.2 | 3.4 | 0.4 | 0.5 | 1.2 | 2.3 | 1.9 | 0.7 |
| 120 | Chinoyo chilli | 4.8 | 2.8 | 3.8 | 3.2 | 2.2 | 10.9 | 5.9 | 3.1 | 96.6 | 2.4 | 5.6 | 1.2 | 0.6 | 3.2 | 4.2 | 3.7 | 1.1 |

Table 4. Composition of fatty acid extracted from Korean red pepper powders

| Varieties | Cultivar | Composition of fatty acid methyl esters(%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C12:0 | C14:0 | C16:0 | C16:1 | C18:0 | C18:1 | C18:2 | C18:3 | C20:1 | C22:0 |
| 101 | Kim chi | 1.0 | 4.3 | 22.2 | 1.2 | 4.3 | 13.5 | 38.4 | 13.8 | 0.7 | 0.6 |
| 102 | Cho hung | 4.1 | 10.4 | 22.9 | trace | 3.8 | 6.6 | 34.2 | 17.9 | trace | Trace |
| 103 | Da jo a | 4.1 | 11.4 | 22.9 | trace | 4.0 | 5.9 | 32.4 | 19.2 | trace | Trace |
| 104 | Muck ge ri | 3.0 | 8.4 | 23.6 | 0.9 | 3.3 | 8.6 | 33.8 | 17.6 | 0.7 | Trace |
| 105 | Po chung chun | 3.3 | 9.3 | 23.1 | 1.0 | 3.3 | 7.9 | 37.1 | 14.9 | trace | Trace |
| 106 | Ma ni da | 2.5 | 7.2 | 24.4 | 1.1 | 3.4 | 9.5 | 33.9 | 17.8 | trace | Trace |
| 107 | Bu kang | 1.3 | 4.5 | 23.9 | 1.2 | 3.8 | 12.5 | 39.3 | 12.8 | 0.7 | Trace |
| 108 | Dae myeng | 2.8 | 7.8 | 24.4 | 1.5 | 3.3 | 10.3 | 32.6 | 16.6 | 0.6 | trace |
| 109 | Hong tap 2 | 2.8 | 7.9 | 23.4 | 1.2 | 4.3 | 6.4 | 30.2 | 22.2 | 1.1 | 0.5 |
| 110 | Pd-1 | 1.7 | 6.6 | 24.5 | 3.2 | 3.9 | 5.5 | 34.7 | 18.8 | 1.0 | Trace |
| 111 | Pd-2 | 2.3 | 7.0 | 22.9 | 1.6 | 3.2 | 9.7 | 35.8 | 16.9 | 0.5 | Trace |
| 112 | 510247 | 2.3 | 7.0 | 20.8 | 0.9 | 5.1 | 9.9 | 39.8 | 15.0 | 0.9 | 0.5 |
| 113 | 510332 | 2.3 | 6.2 | 20.7 | 0.7 | 6.7 | 4.9 | 36.6 | 1.8 | 1.4 | 0.7 |
| 114 | 510348 | 1.1 | 3.7 | 20.3 | 0.9 | 3.3 | 15.2 | 45.4 | 9.0 | 0.7 | 0.4 |
| 115 | 463811 | 1.8 | 5.5 | 24.0 | 1.2 | 5.8 | 5.9 | 37.9 | 16.0 | 1.2 | 0.7 |
| 116 | 4509722 | 2.8 | 9.4 | 25.7 | 1.0 | 5.6 | 4.2 | 36.1 | 14.9 | Trace | trace |
| 117 | 4508094 | 2.4 | 8.5 | 23.5 | 1.1 | 7.1 | 2.8 | 30.1 | 21.8 | 1.8 | 0.9 |
| 118 | 4508095 | 3.1 | 9.3 | 23.9 | 1.2 | 6.4 | 4.0 | 29.1 | 21.3 | 1.6 | Trace |
| 119 | 463942 | 3.4 | 9.4 | 24.0 | 1.0 | 4.3 | 5.8 | 35.1 | 16.1 | 0.8 | Trace |
| 120 | Chinoyo chilli | 1.1 | 3.6 | 20.6 | 1.5 | 3.2 | 20.9 | 36.6 | 11.9 | 0.5 | Trace |

highest (hottest) was detected in HP 115 line. The HP 115 was extremely high capsaicinoids and hot (Table 7), could be used for special medicinal, processing and future breeding materials. Other many cultivars belong to hot cultivars group are available for usual Korean and world wide peppers with other components although those are relatively hot. Hotness evaluation between hot and medium hotness by standard monitoring in Korea can be estimated around 18mg/10mg. Hp 114 was sweet and low pepper line with eating characters. Hp 113-114 have also a good potential for hot pepper breeding.

**Dry matter**

Pepper powder is very important for 'Chim Chi' products, taste spices and medicines. So, the dried characters reflect the productivity of peppers. Dry matters were weighted separately for pericarp, placenta and seed. Hp 110, 111 and 114 were high materials for pericarp power production with lower placenta percentage. These characters were correlated with lower number of seeds, showing good production lines or cultivars. HP 114 had also a good line for sweet cultivar breeding.

**Fruit size and powdered quality**

Ripened fruit sized and the quality after dried powder processing were engaged in Table 7. It was not always correlated with dry matters, but general fresh sizes are

Table 5. The contents of capsaicinoids extracted from Korean red peppers

| Sample No. | Contents of capsaicinoids (mg/100g. dry matter) | | | |
|---|---|---|---|---|
| | Cultivar | Capsaicin | Dihydrocapsaicin | Nordihydrocapsaicin |
| 101 | Kim chi | 7.9 | 4.2 | 2.3 |
| 102 | Cho hung | 5.7 | 3.1 | 1.2 |
| 103 | Da jo a | 8.6 | 4.2 | 2.6 |
| 104 | Muck ge ri | 8.0 | 3.8 | 2.1 |
| 105 | Po chung chun | 10.7 | 4.1 | 2.4 |
| 106 | Ma ni da | 12.5 | 8.6 | 3.8 |
| 107 | Bu kang | 6.2 | 3.6 | 1.7 |
| 108 | Dae myeng | 8.0 | 3.6 | 1.8 |
| 109 | Hong tap 2 | 7.4 | 2.2 | 1.2 |
| 110 | Pd-1 | 9.8 | 4.8 | 2.0 |
| 111 | Pd-2 | 8.5 | 2.6 | 1.5 |
| 112 | 510247 | 15.6 | 7.8 | 2.0 |
| 113 | 510332 | 10.5 | 7.7 | 1.3 |
| 114 | 510348 | | 2.1 | 1.3 |
| 115 | 463811 | 50.2 | 21.3 | 4.8 |
| 116 | 4509722 | 5.5 | 2.3 | 1.5 |
| 117 | 4508094 | 7.5 | 3.3 | 2.1 |
| 118 | 4508095 | 8.5 | 4.1 | 2.8 |
| 119 | 463942 | 6.7 | 5.4 | 1.2 |
| 120 | Chinoyo chilli | 1.4 | 2.6 | 0.1 |

of the most important indicators. 'Da Joa' and HP112-114 lines were the group growing of fairly large and lower number of seeds with tasty powders and adequate pungency.

Form those component analyzed data with eating quality and processing shows the cultivar and selected line characterization that HP 112-113 have good materials for hot, small number of seeded, high productive and good tasty, and that HP114 has a best candidate for large, little number of seeds, high productive and sweet line. However, dark color of powdered character must be introduced from other elite cultivars (for example, 'Da Joa') or lines (HP 116-118).

This experiment strongly suggests the possibility to fond out new variations for future breeding materials and the necessity for component characterization with high quality exploitation. Sterility or cancer resistance are studied well today. This kind of quality improvement is rapidly speared in one field of quality breeding.

For the future. quality and composition breeding, genetic relationships and relationships between fruit and processed materials qualities are more necessary to be clarified for the high quality breeding with high productivity.

Table 6. Percent distribution of pericarp, placenta and seed to the total dry fruit weight in Korean pepper cultivars

| Sample No. | Cultivar | Pericarp(%) | Placenta(%) | Seed(%) | Company |
|---|---|---|---|---|---|
| HP101 | Kim chi | 60.33 | 3.16 | 36.51 | Dw |
| 102 | Cho hung | 55.38 | 9.52 | 35.1 | Dw |
| 103 | Da jo a | 63.56 | 5.26 | 31.18 | Dw |
| 104 | Muck ge ri | 53.00 | 7.30 | 39.7 | Dw |
| 105 | Po chung chun | 60.35 | 1.84 | 37.81 | Sg |
| 106 | Ma ni da | 56.85 | 2.20 | 20.95 | Nw |
| 107 | Bu kang | 54.82 | 1.90 | 43.28 | Sm |
| 108 | Dae myung | 65.89 | 1.84 | 32.27 | Sm |
| 109 | Hong tap 2 | 60.50 | 1.89 | 37.61 | Dw |
| 110 | Pd-1 | 71.43 | 1.10 | 27.47 | Dw |
| 111 | Pd-2 | 72.37 | 1.32 | 26.31 | Dw |
| 112 | 510247 | 64.17 | 2.03 | 33.8 | Dw |
| 113 | 510332 | 63.20 | 1.24 | 35.56 | Dw |
| 114 | 510348 | 67.90 | 2.23 | 29.87 | Dw |
| 115 | 463811 | 61.31 | 4.56 | 34.13 | Dw |
| 116 | 4509722 | 64.89 | 1.33 | 33.78 | Dw |
| 117 | 4508094 | 59.91 | 0.09 | 39.1 | Dw |
| 118 | 4508095 | 63.98 | 1.20 | 34.82 | Dw |
| 119 | 463942 | 65.27 | 2.44 | 32.29 | Dw |
| 120 | Chinoyo chilli | 58.54 | 3.30 | 38.16 | Dw |

These data are shown as the percentage of each dry weight in fruit weight. Dw : Dong won seeds, Sg :Sygenta seeds, Sm : Seminis seeds, Nw : Nong woo seed.

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Table 7. Characteristics of fruit and powder in the cultivars of the Korean pepper.

| Sample No. | Cultivar | Company | Fruit☆ | | | Number of seeds per fruit | Powder pepper | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Length (cm) | Dimeter (cm) | Weight (g) | | Color tone[X] | Eating quality[Y] | pungency[Z] score |
| HP101 | Kim chi | Dw | 8.2 | 1.7 | 12.8 | 98.7 | L | S | M |
| 102 | Cho hung | Dw | 13.4 | 2.0 | 18.2 | 103.0 | L | S | M |
| 103 | Da jo a | Dw | 14.0 | 2.1 | 19.3 | 93.5 | M | M | M |
| 104 | Muck ge ri | Dw | 9.8 | 1.6 | 11.9 | 63.9 | L | M | M |
| 105 | Po chung chun | Sg | 11.3 | 1.9 | 12.3 | 82.1 | MD | I | M |
| 106 | Ma ni da | Nw | 11.9 | 1.8 | 12.5 | 85.2 | M | I | H |
| 107 | Bn kang | Sm | 12.1 | 1.9 | 16.3 | 93.1 | MD | M | M |
| 108 | Dae myung | Sm | 13.2 | 2.0 | 17.2 | 89.4 | M | S | M |
| 109 | Hong tap 2 | Dw | 10.4 | 1.8 | 13.8 | 72.6 | L | M | L |
| 110 | Pd-1 | Dw | 12.6 | 2.4 | 18.8 | 83.9 | L | M | M |
| 111 | Pd-2 | Dw | 12.9 | 2.3 | 19.0 | 88.4 | L | M | L |
| 112 | 510247 | Dw | 15.1 | 2.2 | 20.2 | 78.7 | L | S | H |
| 113 | 510332 | Dw | 15.4 | 2.3 | 21.4 | 82.4 | L | S | H |
| 114 | 510348 | Dw | 14.8 | 2.4 | 19.5 | 76.3 | L | S | L |
| 115 | 463811 | Dw | 12.3 | 1.9 | 17.2 | 82.3 | MD | I | H |
| 116 | 4509722 | Dw | 11.8 | 1.9 | 14.3 | 93.3 | D | I | M |
| 117 | 4508094 | Dw | 12.3 | 2.1 | 18.0 | 104.2 | D | I | M |
| 118 | 4508095 | Dw | 12.7 | 1.8 | 17.4 | 92.7 | D | I | M |
| 119 | 463942 | Dw | 12.8 | 1.8 | 16.9 | 88.2 | MD | M | M |
| 120 | Chinoyo chilli | dw | 11.7 | 2.4 | 18.3 | 98.4 | L | S | L |

☆ : Average of five fruits

X : color tone → L : light, M : medium, D : dark

Y : eating quality (organoleptic) → S : satisfactory, M : medium, I : inferior

Z : pungency score (orgamoleptic) → L : low, M: medium, H : hot.

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