博士論文要約（Summary）

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連合農学研究科
専攻 Course：応用生命科学
氏名 Name：　唐　健民

タイトル **Title**	Research on the Genetic and Chemical Diversity of Camellia Sect. Chrysantha

キーワード Key word（Camellia Sect. Chrysantha）　（ddRAD-seq）　（flavonoids）

By implementing dd-RAD sequencing technology, we generated 75,548 high-quality SNPs and 5,072 InDels from the samples. The SNP genetic information developed from the ddRAD-seq data enabled us to conduct a genetic relationship and phylogenetic analysis of 30 golden camellia species collected from China, unveiling their interspecific relationships within the group.

The contents of total flavonoids, total saponins, total polysaccharides, total phenols, catechins, gallic acid and amino acids in 10 golden camellia flowers were measured, and the results showed that the content differences among each species were significant. The active ingredients in the flowers of 10 golden camellia plants were ranked according to their concentration, from highest to lowest. Golden camellia varieties, ranked in descending order: Camellia achrysantha > Camellia insularis > Camellia pubipetala> Camellia quinqueloculosa > Camellia tunghinensis > Camellia impressinervis> Camellia longzhouensis > Camellia perpetua > Camellia nitidissima > Camellia micrantha .The total flavonoids range in their scavenging rate of DPPH from 66.40% to 91.67%.

Notably, the clearance rate of DPPH· is higher than that of VC (82.5%) at the same concentration. The DPPH ability of Camellia longzhouensis is the strongest among the group, followed by Camellia pubipetala, Camellia tunghinensis was the lowest.

GC-MS was used to compare the volatile components present in fresh flowers from five different golden camellia species. Fifty-two volatile compounds were detected and 51 were identified from five golden camellias; 30 alkenes, 6 lipids, 5 aldehydes, 4 alkanes, 3 aromatics, 1 alcohol, 1 ketone and 1 pyrimidine. The flowers of the five species of Sect. Chrysantha displayed varying volatile component composition. Camellia tunghinensis contained 28 compounds, Camellia longzhouensis contained 22 compounds, Camellia pubipetala contained 15 compounds, Camellia nitidissima contained 9 compounds and Camellia impressinervis contained 4 compounds.

Under ex-situ conservation, plants in the golden camellia group exhibit varying capabilities to enrich distinct nutrient elements in soil, following the pattern of Mg>Mn>P>Fe>K>Zn>Cu>Ca. The five golden camellia plants display robust capabilities in enriching P, Mg, and Mn, evident from their enrichment coefficients ranging from 0.14 to 52.88. Meanwhile, they exhibit moderate enrichment aptitudes for K, Fe, and Zn, as indicated by their enrichment coefficients ranging from 0.07 to 2.25. Enrichment competence for Ca and Cu is weak as their enrichment coefficients are all between 0.01 to 1.96. The 32 correlation indices between plant leaves and soil across different of golden camellia under ex-situ conservation, 48 were found to be significant ($p < 0.05$). In varying time periods, the

polyphenol content of the five species exhibits considerable variation, with possessing 89 the highest total phenols during the flowering and vegetative stages, with contents of 14.2g/100g and 7.13g/100g, respectively. Among the different species, the leaves of Camellia impressinervis exhibit the highest content of polyphenols, measuring 16.57 g/100g. Camellia nitidissima has the highest total polysaccharide content (6.54g/100g) among the five species during the flowering period, while Camellia tunghinensis shows the highest total polysaccharide content (4.34g/100g) during the growth period. Camellia impressinervis yielded the highest total flavonoid content (0.66 g/100g) in its leaves during flowering, while the new leaves at the shoot growth period had the lowest content (0.07 g/100g). The study examined 36 correlations between plant leaf nutrients and primary active compounds at varying growth stages of Camellia japonica plants. The results showed 114 significant indicators ($p < 0.05$), among which 50 were highly significant ($p < 0.01$), while 64 were significant ($p < 0.05$). The element Cu and Zn in the flowering period have a significant promoting effect on the content of total phenolics, total saponins and total polysaccharides in the flowering period and on the total polysaccharides and total phenolics in the vegetative period. SG-TFC was positively correlated with SG-Ca and SG-Mg, indicating that Ca and Mg elements in the taping stage promote the accumulation of flavonoid content.

Finally, the phylogenetic and kinship relationships among the plant species of the Chinese Camellia Sect. Chrysantha have been well revealed through my study. The nutritional value and aromatic properties of the Chinese Camellia Sect. Chrysantha flowers were comprehensively evaluated and analyzed, and the richness of nutrients in Camellia Sect. Chrysantha during different growth periods was also revealed. The study results offer a scientific basis and theoretical foundation for conserving, selecting, and breeding varieties, developing cultivation techniques, and creating new food-borne products of the Camellia Sect. Chrysantha plant.