It is commonly recognized that vegetables in the best season are delicious and have high nutrition. However, there is little scientific evidence for the best season in most vegetables. We investigated the monthly and yearly variations in radical-scavenging (RS) activity, an indicator of antioxidant activity, ascorbic acid and soluble solid content (degrees Brix) of Brassica rapa var. perviridis (komatsuna), a daily vegetable traditionally eaten for a long time in Japan. RS activity was evaluated from January to December for 2~4 years on three farms of Kanto region (two farms in Ibaraki Prefecture and one farm in Chiba Prefecture), Japan.

RS activity was significantly higher (P < 0.05) in December, January, and February than in
the other months for three farms in all tested years (2010-2015). This result was consistently observed in all of the tested years, confirming that winter is komatsuna's best season for antioxidant activity. Since different varieties of komatsuna are cultivated in a year depending on the season, two types of varieties (summer and winter varieties) were cultivated both in summer and winter. The results showed that the RS activity of both varieties was significantly higher (P < 0.05) in winter than in summer. There were no significant differences in RS activity between two summer varieties when they were cultivated in summer and among four winter varieties when they were cultivated in winter. Cultivation days until harvest also differ between summer and winter. When a winter variety was cultivated for 30 days, a typical period in summer, and for 80 days, typical for winter, the RS activity was significantly higher in the summer cultivation period than in the winter cultivation period, indicating that a longer cultivation period is not the reason for high RS activity in winter. Although the RS activity was significantly higher in leaf blades than in petioles, their weight proportion at harvest was similar (leaf blade : petiole = 4 : 6) both in the summer and winter, indicating that the difference in the RS activity of komatsuna between summer and winter was not due to the weight ratio but to the increase in the RS activity of leaf blades in the winter. Ascorbic acid and sugar contents were also significantly higher in the winter (December to February) than in other seasons.

Multiple years of the field studies revealed that the antioxidant activity, ascorbic acid content, and degrees Brix of komatsuna in the Kanto region were higher in winter than in other seasons, and suggested that komatsuna with similar quality may be supplied depending on seasons when it is grown in regions with similar weather conditions.

(英訳) ※和文要旨の場合 (300 words)
If the abstract is written in Japanese, needed to translate into English. (300 words)