（学位第３号様式）

学 位 論 文 要 旨

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題　目	Studies on the function of nitrogen nutrition in monocarpic senescence in soybean (*Glycine max* (L.) Merrill) （ダイズの一斉登熟性における窒素栄養の機能に関する研究）

It is known that soybean [*Glycine max* (L.) Merrill] plants express monocarpic senescence (The plants open flowers and set fruits one time and then whole plant die at maturity). This property is very helpful for the harvest by harvester machine, and makes soybean production easy. However, in most of leguminous crops, such as cowpea, mung bean etc., the leaf and stem keep green even at harvest time. Since soybean plants need much nitrogen to fulfill the synchronized seed growth, large amount of nitrogen in vegetative organs is redistributed to the seeds during seed filling. This redistribution is considered to cause the leaf senescence and whole plant die. However, when does nitrogen move from vegetative part to seeds, and how does nitrogen redistribution affect leaf senescence, are still not clear. The present research was conducted to make clear the function of nitrogen nutrition in monocarpic senescence in soybean

In the field-grown soybean plants, the nitrogen content in the vegetative parts reached the highest level at 60 days after sowing (DAS), then began to decrease at 73 DAS. This decrease is considered that nitrogen redistributed from the vegetative parts to the seeds. At this stage, leaf SPAD values, soluble protein concentration began to decrease simultaneously, suggesting the onset of leaf senescence. Furthermore, the expression of the autophagy gene *GmATG8c* in the leaves increased dramatically from 73 to 85 DAS, which is the duration of nitrogen redistribution from vegetative part to the seeds, indicating the autophagy was associated positively with this process. In the pot-grown plants, when the nitrogen supply was reduced (5 and 25 ppm) at the timing of nitrogen was redistributed from vegetative organs to the seeds, the leaf SPAD value, leaf nitrogen and soluble protein contents decreased quickly compared with the control (100 ppm), whereas these parameters did not change when the nitrogen supply was enriched (200, 400 and 800 ppm). The leaves and stems in enriched nitrogen treatments remained green even at maturity when the whole plant senesced in control plants. In this case, the relative expression of *GmATG8c* showed the lower the nitrogen availability the earlier the up-regulation. The present results revealed that the shortage of nitrogen could stimulate the leaf senescence, while increasing soil nitrogen availability could delay, even stop the leaf senescence, indicating that the nitrogen availability could be a key regulating factor of monocarpic senescence in soybean.

In order to test how nitrogen availability affects the leaf senescence in other crop, mung bean and cowpea plants were also tested by the same method. Low nitrogen treatments (5 and 25 ppm) decreased the SPAD value, photosynthetic rate and nitrogen concentration in the leaf at 8 DAT, however, these factors tended to increase again, and the plants kept green leaf and stem at pod maturity, unlike in soybean. The different results between soybean and mung bean suggested the mechanism of monocarpic senescence is more complicated, depending on the species or the balance between sink and source.