OGATA, NAOKI*, KAZUNORI TAGUCHI, HIROYUKI TAKAHASHI, KAZUYUKI OKAZAKI and KEIJI NAKATSUKA, National Agricultural Research Center for Hokkaido Region in NARO of Japan, Shinsei, Memuro, Hokkaido, Japan 082-0071.

Relationships between amino nitrogen amounts and *Rhizoctonia* root rot resistance on crown root in inoculate condition for sugar beet.

**ABSTRACT**

In Hokkaido of Japan, *Rhizoctonia* root rot have been known as one of the major soil borne diseases cause severe damage to sugar beets. NARCH has developed some *Rhizoctonia* resistance lines from different origins. But it has been not known that the relationships between resistance and sugar yielding abilities under the disease infested condition. The α-amino nitrogen (A-N), one of the harmful non sugar included in sugar beet crown root, cause the sugar quality down. Recently it have been reported that sugar beets selected to the *Apanomyces* root rot resistance showed relatively higher amount of A-N than original populations. And also reported that under stress conditions such as the high nitrogen fertilizer, drought condition and so on, sugar contents and A-N amounts in sugar beet root showed lower and higher, respectively. However little has been known about the changes in the amount of A-N and its distribution in crown roots after disease infection.

This research was conducted to investigate the amounts and distributions of the A-N in the crown roots of the O-type (maintainer of male sterile lines) sugar beets, caused root rot in a field artificially inoculated with the fungus, *Rhizoctonia solani* (*Thanatephorus cucurimeris*).

Field tests were done in 2000 and 2004. The materials used were O-types included different resistance level. Experiment design was sub-split-plot design of 4.05m²/plot with 2 replications, in which inoculation or not (control) as main plot, and materials as sub plot. Inoculums used were barley medium cultured *Rhizoctonia solani* AG2-2 pf-28, and inoculated in a field at about 90 days after sowing. The O-types were estimated for resistance by the disease area rates (%) on crown root with the passage of time from the inoculation date. At the same time, brei were sampled from these crown roots, and measured for the A-N amounts. Only the test in 2004, it was investigated that the changes in the A-N distributions in a root of 15 days and 28 days after inoculation. Firstly a root sample was cut off the crown and root tip side on a half way of root length. These samples were cut in 3 parts as inside, middle and outside part from periphery of center of vascular bundle to the epidermis. By using these brei, A-N amounts were measured.

From the results in 2000, *Rhizoctonia* root rot were shown at 9 days after inoculation, and at 28 days O-types could be classified clearly to 3 groups by multiple range test. Resistant O-types showed small disease area rates below 10%, on the other hand susceptible one showed them over 80%. The amount of A-N increased with infection regardless of the resistance of O-types, and at 28 days after inoculation the most amounts of A-N on an
average 2.65 meq / 100g were shown. However in an uninfested field, the amounts of A-N were not changed through the growing periods, and all resistant O-types showed much more amounts of A-N, over 2 meq / 100g, than the susceptible one. There were significant negative correlations between A-N amounts at inoculation date and disease area rates. From the results in 2004, by the disease infested, A-N amounts were increased as same manner of 2000, and also A-N distribution patterns in the roots were different from those of uninfected, healthy roots; the A-N amount increased in inside and decrease in outside of roots. And there were significant differences for A-N amounts between inside and outside of root. In concluding, it was appeared that Rhizoctonia root rots would make sugar quality down because it increased the A-N amount of sugar beet crown roots. The presence of substantial A-N in the O-types having Rhizoctonia root rot resistance implies that these two traits were connected with each other and difficulty in breeding Rhizoctonia root rot resistant lines with higher sugar quality. It was suggested that A-N in the sugar beet could be used for synthesizing some kind of the protein nitrogen against to the Rhizoctonia root rot infection.