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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 4.05m^2/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.