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CULTIVAR DIFFERENCES IN AMINO ACIDS CONTENT IN THE XYLEM SAP OF TEA

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Summary

As an index of the useful efficiency after nitrogen fertilization, amino acids content in the xylem sap of tea plant was measured. The extracting method of the xylem sap is as follows. The plant was cut off at 2-3cm above the ground. A silicone tube is put in a cut end and syringe which was in the minus pressure condition was connected. After several time, xylem sap accumulated in a syringe are extracted.

The amino acids content in the xylem sap was high at two days after fertilization.

As the time to extract, it was desirable in the morning. The first sampled xylem sap (about 1 hour) was pouring out, after 1-3hours extracted.

The optimal season to extract a xylem sap of the one year old cuttings was September.

It was assumed that "Asanoka" is the high adaptability to the low fertilizer condition, because amino acids content of the cultivar in the xylem sap is usually higher than that of "Asatsuyu".

Keywords

Tea, Amino acids, Xylem sap, Nitrogen fertilizer

Introduction

Quality of Japanese green tea has been made so good that there are many nitrogen contents in new shoots. Therefore, Japanese tea farmer fertilize much nitrogenous in the tea garden. Consequently much NO₃-N came to flow out of the tea area and environment has deteriorated. In order to solve this problem, it is necessary to decrease the nitrogen fertilization by raising the use efficiency of nitrogen.

In recent years, several studies have been made on soil science for decrease fertilizer,

but few studies on breeding science. In this paper, we presumed the use efficiency of the nitrogen immediately after fertilization by measuring the amino acids content in the xylem sap.

Materials and methods

The xylem sap was extracted by the method shown below. Tea plants were cut off at 2-3cm above the ground and removed leaves. A silicone tube is put in a cut end and syringe which was in the minus pressure condition was connected (Fig. 1).



Fig.1 Extracting xylem sap by syringe.

They were kept with the freezer until analysis. We analyzed the amino acids, NH₄-N and NO₃-N by HPLC and ion chromatography.

Exp. 1

We planted one year cuttage tea 12cm diameter pot in sand culture on 8th May. Tea plants were grew by no fertilizer until 0.1% urea solution was given 100ml per pot to on 31st July. On August 2nd, extracted xylem sap analyzed amino acid, NO₃-N, and NH₄-N. On 6th August, tea plants were cut in 9:00 a.m. and 3:00 p.m., and It extracted xylem sap.

Exp. 2

The cutting was carried out on middle of June according to the custom in the nursery. Nitrogenous fertilizer $(5gN/m^2)$ was given on middle of September, xylem sap were extracted fertilization after 2, 6 and 14days. And also xylem sap was extracted after giving a nitrogenous fertilizer end of October and early in next March.

Results and Discussion

Exp.1 Table 1 Nitrogen constitution in xylem sap. Most nitrogen in Sampling on 2nd August: two days after urea fertilization. xylem sap was time after Glutamine Theanine Glutamic acid glutamine and cut off -N(ppm) -N(ppm) -N(ppm) NO3-N(ppm)NH4-N(ppm) 156.7 37.7 theanine-N and 0-1 hour 2.2 0.9 2.2 few 1-2 401.9 97.9 2.8 0.9 1.8 rates of NO₃-N and 2 - 3441.4 115.0 2.8 1.0 2.1 NH₄-N. Nitrogen 3 - 4369.7 115.2 2.4 0.9 2.5 content in xylem sap 4-5 290.7 98.4 2.0 0.6 2.1 5-6 240.4 92.5 was the highest 1-3 1.8 0.5 2.1 6-7 144.7 62.1 1.3 0.7 2.7 hours after cutting, at 7-8 96.4 44.0 1.1 1.0 3.5 that time, glutamine-N 8-9 66.4 33.3 0.7 1.2 3.4 content was about

400ppm and theanine-N content was about 100ppm. After that, nitrogen content decreased (Table 1). In the experiment after this, only the amino acids content which added glutamine and theanine content was analyzed.

When tea plants cut at 9:00 a.m., amino acids content was the highest in 2-3 hours after

in xylem

sap(ppm)

500

400

300

200

cutting. In this time, glutamine content was 180.6ppm (glutamine-N 34.6ppm) and theanine content was 258.1ppm (theanine-N 41.5ppm). When tea plants cut at 3:00 p.m., amino acids content decreased with progress of time and after 6:00 p.m. there were almost no amino acids (Fig.2). But in the next morning, amino acids content in xylem sap cutting at 3:00 p.m. was a little less than 200ppm. In the experiment after this, we cut tea

plant at about AM 9:00 and extracted after 1-3hours cutting.



AM9:00-Cut

- PM3:00-Cut

Fig. 2 Amino acids content in xylem sap after cut off. Sampling on 6th August: 6days after urea fertilization.

Exp.2

In the experiment for October, amino acids content was higher cultivar with a growth late stop of autumn shoot. In the experiment for March, amino acids content was higher cultivar with early budding.

In the experiment for middle of September, amino acids content in xylem sap was 2days after fertilization higher than 14days, "Asanoka" is highest amino acid content, "Asatsuyu" is lowest one(fig 3).



"Asanoka" is assumed the cultivar which exhibits high ability low fertilization condition in Kagoshima Tea Experiment. In

Fig. 3 Cultivar differences in amino acids content in xylem sap after nitrogenous fertilizer.

Nitrogenous fertilizer on 10th September.

our experiment, since "Asanoka" transport the amino acid so much to the ground part, it was shown that nitrogen absorptive power was high. We think that the selection method of suitable for low fertilization was attained by analyzing the amino acids content in xylem sap.