Gehalt freier Asparaginsäure und Alanin in Erbsenkeimlingen vor und nach der Transaminierung

| Pflanzenorgan | Versuch | | Asparaginsäure | | Alanin | |
|---|---|---|---|---|---|---|
| | | | µg/1 g Trockengewicht | µg/1 Organ | µg/1 g Trockengewicht | µg/1 Organ |
| Achsen | Kontrolle | A | 1212,0 ± 144,8 | 24,24 ± 2,90 | 610,0 ± 70,0 | 12,20 ± 1,40 |
| | | B | 901,0 ± 43,0 | 18,02 ± 0,86 | 435,0 ± 35,0 | 8,70 ± 0,70 |
| | 1% $SO_2$ | A | 375,0 ± 18,3 | 6,28 ± 0,31 | 512,5 ± 4,2 | 8,60 ± 0,07 |
| | | B | 305,8 ± 15,8 | 5,12 ± 0,26 | 396,0 ± 12,5 | 6,56 ± 0,28 |
| Wurzeln | Kontrolle | A | 3637,0 ± 112,5 | 109,40 ± 3,38 | 281,2 ± 31,2 | 8,44 ± 0,94 |
| | | B | 1640,0 ± 75,0 | 49,32 ± 2,25 | 93,7 ± 6,2 | 2,82 ± 0,18 |
| | 1% $SO_2$ | A | 805,1 ± 67,1 | 12,48 ± 1,04 | 200,0 ± 6,4 | 3,10 ± 0,10 |
| | | B | 383,2 ± 60,6 | 5,94 ± 0,94 | 154,8 ± 12,9 | 2,40 ± 0,20 |
| Kotyledonen[a] | Kontrolle | A | — | — | 760,0 ± 4,4 | 71,14 ± 0,42 |
| | | B | — | — | 560,0 ± 97,7 | 52,42 ± 9,22 |
| | 1% $SO_2$ | A | — | — | 585,4 ± 32,4 | 63,60 ± 3,56 |
| | | B | — | — | 494,5 ± 14,4 | 53,72 ± 1,58 |

A, Gehalt nach der Transaminierung. B, Gehalt ohne Transaminierung (endogener Gehalt). [a] Wegen unbefriedigender Trennung von Asparagin- und Glutaminsäure auf den Papierchromatogrammen wurde der Asparaginsäure-Gehalt nicht bestimmt.

Gesamtgehalt (nach der Transaminierung) und endogenem Gehalt (ohne Transaminierung) der entsprechenden Aminosäure berechnet.

In den Wurzeln der mit $SO_2$ behandelten Erbsen-Keimpflanzen ist der endogene Alanin-Gehalt angestiegen, während er in den Kotyledonen und Achsen schwach und auch der endogene Asparaginsäure-Gehalt in den Achsen und Wurzeln vergifteter Keimpflanzen signifikant gesunken ist. Die Menge der entsprechenden Aminosäure (Alanin, Asparaginsäure), die durch die Transaminierung in den Organen der Kontroll-Keimpflanzen entstanden ist, wird als 100%ige Aktivität der entsprechenden Transaminase angesehen. Nach 48-stündiger Einwirkung des $SO_2$ sank die Aktivität der Glutamat-Oxalacetat-Transaminase (GOT) in den Achsen um 77,8% ($P < 0{,}01$) und in den Wurzeln um 78,9% ($P < 0{,}001$). Die Aktivität der Asparagat-Pyruvat-Transaminase (APT) sank in den Achsen um 33,5% (nicht signifikant), in den Wurzeln um 76,0% ($P < 0{,}05$) und in den Kotyledonen um 54,5% ($P < 0{,}01$) im Vergleich zur Kontrolle.

Die Ursache der Störung der Transaminierungen durch $SO_2$ kann verschieden sein, unter anderem zum Beispiel infolge der Bildung des Bisulfit-Addukts des Pyridoxals[7], Koferments der Transaminasen oder Umwandlung des Cytosins zu Uracil[8], was die Struktur der DNA, RNA und schliesslich der Enzym-Proteine verändert. Die endgültige Erklärung dieser komplizierten Frage muss künftigen Versuchen vorbehalten werden.

*Summary.* Fifteen-day-old green pea seedlings were intoxicated 48 h by 1% gaseous sulphur dioxide and in their individual organs the activity of glutamate-oxalacetate (L-aspartate: 2-ketoglutarate-aminotransferase) and aspartate-pyruvate (L-alanine: oxalacetate-aminotransferase) transaminases estimated. The activity of glutamate-oxalacetate transaminase in the intoxicated seedlings was lowered in shoots by 77.8% and in roots by 78,9% as compared with the control plants. The activity of aspartate-pyruvate transaminase was lowered in shoots by 33.5%, in roots by 76% and in cotyledons by 54.5% in comparison with the control plants.

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## Effect of Ultrasonic Waves on the Ribonuclease Activity

The implication of RNA in growth has been demonstrated for several plant tissues[1]. On the other hand the ultrasonic treatment was found to decrease the cell elongation, acting on the protein-nitrogen (PN) level[2,3]. It was of interest to complete our previous observations and to analyse – for the lentil roots – the changes of the ribonuclease (RNase) activity, which in some way controls the endogenous RNA content[4].

16 mm roots of *Lens culinaris* seedlings were subjected to a non-cavitating ultrasonic irradiation of 30 min at 2.4 Watt/cm², in an isotonic mannitol solution (800 kHz quartz generator[5]). The method to test the RNase activity was previously described[6], and adapted to the present material[7]. It is based on the observed degradation of macromolecular RNA in solution, by incubation with diluted root extracts. Such degradation is displayed by the increase of optical density (OD) at 260 nm in the supernatants, after removal of the undegraded RNA by precipitation. The difference in OD between the controls and the incubated samples is taken as a measure of

RNase activity. The effect of ultrasonic waves was studied for two kinds of sections prepared from the 16 mm roots: 0–5 mm (from the apex, section I) and 5–10 mm (section II).

As shown in the Table, the RNase activity is obviously decreased for section I by the ultrasonic treatment, when the result is presented in terms of fresh weight. The water content of ultrasonicated roots is almost completely stable[3], whereas the PN level is significantly decreased[3]. As a consequence, no RNase activity change is shown when the result is expressed in terms of PN weight, because the variations of the enzymatic activity correspond to some extent to the PN level decrease. In regard to section II, no significant RNase activity change is observed, no matter what unit of reference is used. Therefore we can conclude that the ultrasonic waves do act on section I only (in the limits of the irradiation duration and the intensity level used).

It was often found that the ultrasonication, in the presence of oxygen, decreases the activity of several enzymes in solution, and no enhancement of enzymatic activity has ever been observed[8,9]. As regards RNase, the irradiation of solutions can lead to the detachment of low molecular peptides or of amino acids, generally without loss of activity[9]. However, inactivation is observed in the presence of OH radicals, which can be produced by cavitation[9,10].

In the present study, the mechanism of inactivation must be entirely different, since cavitation does not occur. Compared to water solutions, the cytoplasm is characterized by a higher viscosity. As a result, ultrasonic waves bring on significant thermal effects. The propagation of sound waves is essentially adiabatic, so that the resulting raising of temperature may cause enzyme denaturation. Since the ultrasonication is a non-cavitating one, changes of pH do not occur. They could be induced by electrochemical effects due to cavitation, and these changes would also explain denaturation.

Compared to section II, section I shows a higher cytoplasmic density[11] and a lower water content[3], which indicates a higher viscosity. The discrepancy between section I and II with respect to RNase inactivation can therefore be explained by the higher cytoplasmic viscosity of section I.

In spite of RNase inactivation, the PN level is decreased, as has been observed several hours after ultrasonication[2,3]. Therefore, the RNA biosynthesis must also be disturbed. Furthermore, the protein synthesis can be directly inhibited by the ultrasonically-induced ribosomes disintegration[12].

*Résumé.* L'irradiation ultrasonique de racines de *Lens culinaris* provoque une baisse de l'activité RNasique dans la zone apicale (0–5 mm). L'ultrason étant non-cavitant, cette réduction d'activité doit être causée par l'action dénaturante liée aux effets thermiques de la perturbation ultrasonique. La relativement haute viscosité cytoplasmique de la zone apicale expliquerait pourquoi celle-ci est la seule à être affectée.

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RNase activity (expressed as $10^2 \times$ OD increase) for the 2 sections prepared from non-irradiated (NIR) and irradiated (IR) roots

| | NIR | IR | Change (%)[a] |
|---|---|---|---|
| Section I per 50 mg fresh weight | 7.1 | 5.8 | − 18.3 |
| Section I per 50 µg PN | 1.28 | 1.30 | + 1.6 |
| Section II per 50 mg fresh weight | 10.4 | 10.1 | − 2.9 |
| Section II per 50 µg PN | 6.38 | 6.60 | + 3.4 |

[a] % = 100. (IR–NIR)/NIR. Each value is the mean of 4 analyses.

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## Non-Specific Esterases in Females of *Aedes aegypti* (L.)

Previous work on non-specific esterases in mosquitoes was carried out comparing the isozyme patterns during development from egg to pupa in *Aedes aegypti*, *Culex pipiens pipiens* and *Culex pipiens fatigans* (BRIEGEL and FREYVOGEL[1]). It was shown that during the 4 larval stages, where growth processes take place, the pattern of enzymes is similar and shows most bands. Developing embryos differ from the larval stages as well as pupae and teneral adults. The last 2 were similar to each other within one species. Adults showed no sexual dimorphism with regard to these enzymes.

In order to extend knowledge on non-specific esterases during the lifespan of mosquitoes, the present paper deals with changes in this group of enzymes which occur during the adult life of female *Aedes aegypti* (L.). For this purpose

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