EFFECT OF PHYTOHORMONES ON UREASE ACTIVITY OF MARROW COTYLEDONS
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ABSTRACT

Urease (EC 3.5.1.5, urea amidohydrolase) was isolated from marrow cotyledons of 5-day old seedlings. The effect of exogenous phytohormones namely indolebutyric acid, naphthaleneacetic acid, indoleacetic acid, indolepropionic acid, indoleacetic acid and zeatin at various concentrations (100-600 µmol) on urease activity in the cotyledons of marrow was investigated. The optimum concentrations of the five compounds that gave the highest activities of urease were 500 µmol for indolebutyric acid, indoleacetic acid, and 400 µmol for naphthaleneacetic acid and indolepropionic acid. However, the optimum concentration for zeatin was 100 µmol.

INTRODUCTION

Urease (EC 3.5.1.5, urea amidohydrolase), a nickel-dependent metalloenzyme, catalyzes hydrolysis of one molecule of urea results in the release of two molecules of ammonia and one molecule of carbon dioxide (Lam et al., 1996).

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\text{Urea} + \text{H}_2\text{O} \rightarrow \text{Ammonia} + \text{Carbon dioxide}
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Urease is an abundant seed protein in many members of the Leguminosae, Cucurbitaceae, Asteraceae, and Pinaceae (Bailey & Boulter, 1971). Urease is also found at lower levels in the vegetative tissues of most or all other plants (Hogan et al., 1982).

This enzyme is present in two isoforms (Holland et al., 1971); the embryo-specific urease, which is synthesized only in the developing embryos (Turley & Ching, 1986) and the ubiquitous urease, which is found in all vegetative tissues (Pollaco et al., 1993).

Moreover, urease is the only nickel-containing metalloenzyme yet identified in plants (Polacco & Holland, 1993; 1994).

The present paper aimed to investigate the effect of some phytohormones on urease activity of marrow (Cucurbita pepo L.) cotyledons. The tested phytohormones were indolebutyric acid, naphthaleneacetic acid, indoleacetic acid, indolepropionic acid, Indoleacetic acid (IAA) and zeatin.

MATERIALS AND METHODS

The germination of marrow (Cucurbita pepo L.) seeds. This method was carried out according to El-Shora, (2001). The preparation of urease was carried out according to El-Shora, (2001). This assay of enzyme is made according to El-Shora (2001).

Total protein in the extract was determined by the method of Meyer-Bothling & Polacco, J.C. (1987).

Phytohormones were tested at 100-600 µmol for 3 days. Samples of treated and non treated plants were taken and analyzed. All values are means of three measurements± S.E.
RESULTS

Indolebutyric acid on urease activity in the cotyledons was studied. This compound was tested at various concentrations (100 – 600 μmol). The results were shown in Fig 1. These results indicate that by increasing indolebutyric acid concentration, urease activity increased until concentration 500 μmol after which the activity decreased. Naphthaleneacetic acid induced the enzyme activity. The induction of urease was dependent on the concentration. It was observed that concentrations range from 100 to 400 μmol (Fig. 2) induced the enzyme activity whereas the higher concentrations 500 and 600 μmol were inhibitors. Indoleacetic acid (IAA) at the same different concentrations (100- 600 μmol).The results in Fig. 3 indicate that urease activity was induced by IAA up to 600 μmol; however at 600 μmol the enzyme activity was reduced. It is noted that the enzyme activity at 600 μmol IAA was still higher than the control samples to which no IAA was added. Indolepropionic acid was stimulator at the range of 100 to 400 μmol (Fig. 4) whereas 500 and 600 μmol reduced the activity of the enzyme. When the cotyledons were incubated with zeatin (10 – 100 μmol). The results shown in Fig 5 illustrate that the enzyme activity increased with increasing zeatin concentration. It is apparent that the enzyme activity reached 52.8 U mg⁻¹protein after treatment with 100 μmol zeatin.

Discussion

Urease activity of zeatin-treated cotyledons increased to a level higher than in water –treated control cotyledons. In support, urease was induced by Aspergillus niger in the presence of zeatin in growth medium (El-Shora et al., 2005).

It is possible that zeatin may act at the transcriptional or posttranscriptional regulation. However, this needs further investigation. Another possibility for the increase of the enzyme activity by zeatin is that it may be involved in urease phosphorylation. To test this hypothesis saturoporine a well known inhibitor of protein kinase was added with zeatin to see whether the induced-activity of the enzyme by zeatin could be inhibited.

Also, treatment of cotyledons with zeatin in the presence of Furd-cordycepin and α-aminitin fails to cause an increase in urease activity. This result strongly supports the suggestion that zeatin-induced protein synthesis is necessary for the increased urease activity by zeatin.

Urease activity showed remarkable enhancement in triazoles treatments. Triazole compounds increased other plant enzymes such as amylase and invertase (Kishorekumar et al., 2007). This induction of acid phosphatase activity varies with concentration of triazoles. Application of triazole compounds may be proved to be a good tool in enhancing urease in cotyledons of marrow plants.
Fig 1: Effect of indolebutyric acid on urease activity.

Fig 2: Effect of naphthaleneacetic acid on urease activity.
Fig 3: Effect of indoleacetic acid on urease activity

Fig 4: Effect of indolepropioic acid on urease activity
Fig 5: Effect of different concentration of zeatin on urease activity

REFERENCES


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تأثير هرمونات النمو النباتية على نشاط إنزيم اليوريزي في فلقات نبات القرع.
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هدف هذا البحث إلى دراسة تأثير بعض هرمونات النمو مثل اندول حمض البروبيونيك و اندول حمض الخليك و اندول حمض البروبيونيك و الزياتين على نشاط إنزيم اليوريزي في فلقات نبات القرع المعزولة من بادرات نبتة لمدة خمسة أيام. و أتضح من الدراسة أن معاملة الفئات بكل من هذه المركبات الخمس قد أدت إلى زيادة النشاط الإنزيمي حيث كان التركيز الامثل لهذه المركبات كالآتي: 100, 000, 000, 000, 000, 000 ميكرومول.