



University of Kentucky  
UKnowledge

---

International Grassland Congress Proceedings

XX International Grassland Congress

---

## Accumulation of Polyphenols and Major Bioactive Compounds in *Plantago Lanceolata* L. as a Medicinal Plant for Animal Health and Production

Y. Tamura

*National Agricultural Research Centre for Tohoku Region, Japan*

K. Yamaki

*Japan International Research Centre for Agricultural Science, Japan*

Follow this and additional works at: <https://uknowledge.uky.edu/igc>

 Part of the [Agricultural Science Commons](#), [Agronomy and Crop Sciences Commons](#), [Plant Biology Commons](#), [Plant Pathology Commons](#), [Soil Science Commons](#), and the [Weed Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/20/satellitesymposium3/30>

The XX International Grassland Congress took place in Ireland and the UK in June-July 2005.

The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

Proceedings Editor: D. A. McGilloway

Publisher: Wageningen Academic Publishers, The Netherlands

© Wageningen Academic Publishers, The Netherlands, 2005

The copyright holder has granted the permission for posting the proceedings here.

---

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

# Accumulation of polyphenols and major bioactive compounds in *Plantago lanceolata* L. as a medicinal plant for animal health and production

Y. Tamura<sup>1</sup> and K. Yamaki<sup>2</sup>

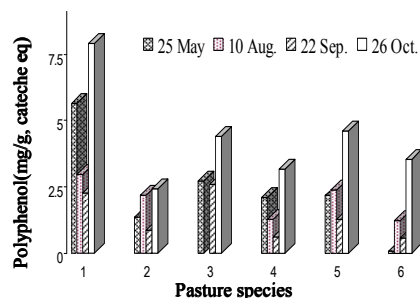
<sup>1</sup>National Agricultural Research Centre for Tohoku Region, Shimokuriyagawa Morioka, Iwate 020-0198, Japan, Email: fumi@affrc.go.jp, and <sup>2</sup>Japan International Research Centre for Agriculture Sciences, 1-2, Ohwashi, Tsukuba, Ibaraki, 305-8686, Japan

**Keywords:** animal health, bioactive compounds, medicinal plants, *Plantago lanceolata* L., polyphenols

**Introduction** Producing animals without the use of feed-grade antibiotic growth promoters and chemical medicines is sought. Scientific studies with this aim have focused on medicinal plants to identify and quantify any beneficial effects that they might have on animal production. *Plantago lanceolata* L. has been used in herbal medicines and is currently being evaluated as a potential pasture species because of its beneficial effects on animal health. In the present study, the accumulation of polyphenols in *P. lanceolata* is compared to that in principal pasture species, and genetic variation and environmental changes in the major bioactive compounds in *P. lanceolata* are investigated.

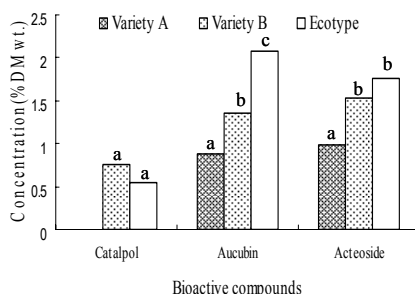
**Materials and methods** The total polyphenol content of plantain leaves was determined using the Folin-Denis method, and was compared to the values for the following principal pasture species: *Dactylis glomerata* L., *Phleum pratense* L., *Lolium perenne* L., *Phalaris arundinacea* L. and *Trifolium repens* L.. The catalpol, aucubin and acteoside contents of two varieties and one ecotype of *P. lanceolata* were quantitatively determined using high-performance liquid chromatography (HPLC) of plant samples obtained throughout the growing season (Tamura & Nishibe, 2002), and under different environmental and cultivation conditions.

**Results** The highest total polyphenol content was observed in *P. lanceolata*, and was up to twice that of the average value for the pasture species tested (Figure 1). The aucubin and acteoside contents were relatively high, and significant genetic variation was detected within the cultivars and in comparison with the ecotype (Figure 2). By contrast, the catalpol content was low and this compound was absent from one variety. Plants grown under a high light intensity with a low nitrogen fertiliser application accumulated greater amounts of these compounds.



**Figure 1** Polyphenol content of *P. lanceolata* and Pastures

Note: 1; *Plantago lanceolata* L., 2; *Dactylis glomerata* L., 3; *Phleum pratense* L., 4; *Lolium perenne* L., 5; *Phalaris arundinacea* L., 6; *Trifolium repens* L.



**Figure 2** Bioactive compounds in leaves of varieties and ecotype of *Plantago lanceolata* L.

Note: Different letters indicate statistically significant differences between groups at the 5% level

**Conclusions** *P. lanceolata* accumulated greater amounts of polyphenols than the principal pasture species, and significant genetic variation was observed in the levels of bioactive compounds. Several previous studies have examined the effect of *P. lanceolata* on animal health and meat quality, and have reported positive effects, such as a decreased n-6/n-3 fatty-acid ratio in chickens, and decreased blood glucose levels and a higher meat grade in pigs. Further studies will be necessary to clarify the precise effects of bioactive compounds on animals.

## References

Tamura, Y. & N. Sansei (2002). Changes in the contents of bioactive compounds in plantain leaves. *Journal of Agricultural and Food Chemistry*, 50, 2514-2518.