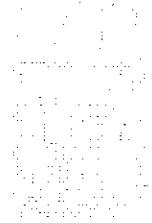




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## NITRATE CONCENTRATION IN NEW ZEALAND SPINACH

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**Introduction**

Although the current epidemiological data provide conflicting evidence regarding the potential health risks from nitrate intake, it is widely accepted that long-term exposure to high level nitrate diets is undesirable (Boink and Speijers, 2001; Santamaria, 2006). Despite the many sources of nitrates in current diets, vegetables are considered the major one. Given the problem, the UE has set maximum levels of nitrates allowed for spinach and lettuce. These limits depend on the growing conditions of the vegetables and vary from 2000 mg kg<sup>-1</sup> for “iceberg” type lettuce, grown in the open air, to 4500 mg kg<sup>-1</sup> for lettuces grown in greenhouses during the winter period (EC regulation 563/2002). Nitrate levels in other vegetables should not exceed 2500 mg kg<sup>-1</sup>. New Zealand spinach [*Tetragonia tetragonioides* (Pallas) O. Ktze] has a culinary use similar to common spinach (*Spinacea oleracea* L.) and appears regularly on the market. However, available information on the potential of this species to accumulate nitrates is scarcer. In this work, we report on nitrate content analyses in New Zealand spinach that regularly appear in our supermarkets.

**Material and methods**

Commercial sheaves of New Zealand spinach (figure 1) were bought in two regional supermarkets. From each sheaf, three sub-samples were prepared by separating the leaves (petiole + blade) from stems. Dry matter percentages of sub-samples were obtained by weighing the fresh and oven-dried (70 °C) material. Dried material was ground and sieved. Extracts were prepared by adding 50 ml of distilled water to 1 g of dry matter and shaking for an hour. The extracts were filtered in paper Watmann 40 (Ø 12.5 cm), and nitrate concentrations determined by UV/Vis. spectrophotometry.

Figure 1 – New Zealand spinach  
(*Tetragonia tetragonioides*)

**Results**

New Zealand spinach shows very high nitrate concentrations in stems but also in leaves (figure 2 a). Stems presented values which could surpass 10000 mg kg<sup>-1</sup>, while leaves (petiole + blades) could reach 4000 mg kg<sup>-1</sup>. The leaves represent a higher proportion of the total fresh weight of the vegetable (figure 2 b). Thus, taking into account the differences in fresh weight of stems and leaves and their nitrate concentrations, if people did not eat the stems, more than 50 % of total nitrates accumulated in the vegetable could be excluded from their diet (figure 2 c).

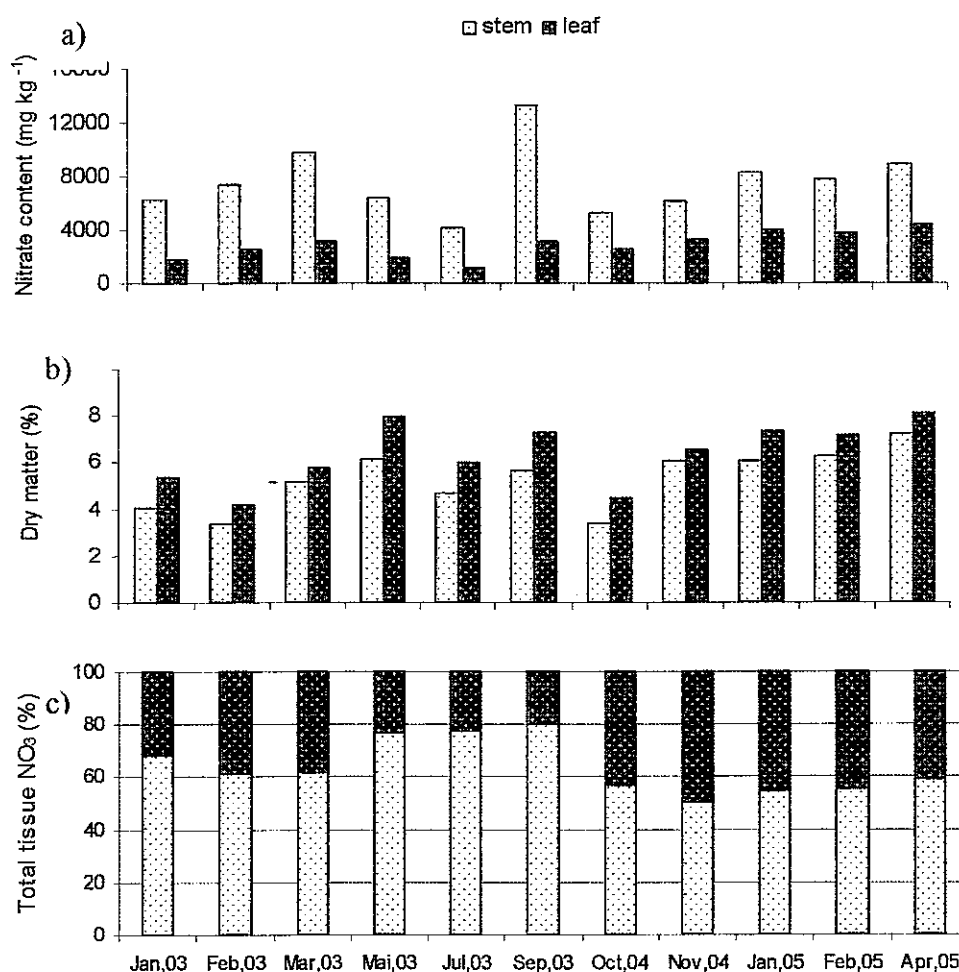


Figure 2. Tissue nitrate concentrations (a), dry matter % in stems and leaves (b) and total amount of nitrates in stems and leaves expressed as percentage (c).

### Discussion

New Zealand spinach is a species which accumulates nitrates at high levels, even compared to other nitrate accumulating species, such as common spinach, lettuce, beetroot, cabbage or radish. Thus, more attention should be given to this particular species. The variability in nitrate content among the different samples means that much more could be done in N fertilisation practices in order to reduce nitrate accumulation in New Zealand spinach. It was not clear how the influence of season (the available sunlight and temperature) affected nitrate levels in plant tissues. People should avoid eating the stem or any of its parts, so as to significantly reduce the amount of nitrate intake.

### References

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 Santamaria, P. 2006. Nitrate in vegetables: toxicity, content, intake and EC regulation. *J. Sci. Food Agric.* 86, 10-17.