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PRESENT STATUS OF NITRATES AND NITRITES IN VEGETABLES

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Five commonly grown vegetables i.e. radish, turnip, 'methi', spinach and cauliflower were analyzed for nitrate and nitrite contents. The relationship of soil and water nitrates and nitrites with those of vegetables and the manuring effect was also studied. The average nitrates and nitrites were highest in the radish i.e. 83.18 and 0.19 ppm, then comes turnip and spinach for which the values were 71.08, 71.83 and 0.11 and 0.08 ppm respectively. 'Methi' nitrates and nitrites were 67.78 and 0.11 ppm, whereas cauliflower had 50.55 and 0.08 ppm. The effect of water nitrates was more evident than soil nitrates in increasing the nitrate values of the vegetables. The nitrate content of both soil and water did not show any relationship with those of vegetable nitrites. The values observed for nitrates and nitrites in vegetables are within the permissible limits reported by WHO (1972).

INTRODUCTION

Over the past several years overwhelming evidence has accumulated that there are certain chemicals which result in fatal diseases due to their toxic levels. Nitrate has been considered one of them, which itself is less toxic but serves as a starting material for the formation of nitrites, nitrous acid and nitrosamines. These toxic nitrites and nitrosamines damage DNA and result in hereditary alterations. Methemoglobin formation, carcinogenicity, hepatotoxicity, and teratogenic effects due to higher ingestion of nitrates and nitrites have also been reported

(Magee and Barnas, 1967). The major sources of nitrates and nitrites are vegetables, water, cured meat and a number of other feeds. It has been observed that use of nitrogenous fertilizers at higher levels increases the level of nitrates and nitrites in vegetables (Fassett, 1966). A study regarding the status of nitrates and nitrites in various vegetables is presented here.

MATERIALS AND METHODS

The following five commonly grown vegetables were selected for this study: i) radish, ii) turnip, iii) 'methi', iv) spinach, and v) cauliflower. Twenty freshly harvested samples of these vegetables were collected from various districts of Punjab. They were washed with distilled water and used for estimation of nitrate and nitrite content.

Nitrate extraction: For nitrate extraction 10 g sample of a vegetable was cut into small pieces and macerated with 40 ml distilled water in a mechanical blender. The slurry was transferred to 250 ml beaker and heated for one hour. After cooling it was filtered through Whatman No. 42 filter paper. Total volume of the filtrate was made 100 ml in a volumetric flask. Of this, 3 ml filtrate was taken for nitrate estimation.

Nitrite extraction: For nitrite extraction, 5 g vegetable sample was cut into small pieces and macerated with 40 ml distilled water. The macerate was heated to 80°C and transferred to 500 ml flask, adding further 260 ml water. The solution was placed in boiling water bath with occasional shaking for two hours. To this, 5 ml saturated mercuric chloride solution was also added. After cooling the mixture was filtered and the volume was made upto 500 ml.

Nitrate and nitrite estimation: After extraction, nitrate estimation of the sample was made by modified Sims and Jackson (1971) method as described by Kowalenko and Lowe (1973). Nitrite contents of the samples were measured by the method as described by Page et al. (1982). Nitrate and nitrite contents in water irrigating the vegetables were estimated directly, while those in soil were estimated after extraction in solution form.

RESULTS AND DISCUSSION

The nitrate and nitrite content of radish (Raphinus sativus) ranged between 38.00 to 12.00 ppm and 0.08 to 0.30 ppm with average values of 83.18 and 0.19 ppm respectively. The control samples to which no fertilizer was added and tap water was used for irrigation, showed 34.28 and 0.07 ppm of nitrate and nitrite content, respectively. In case of turnip (Brassica rapa), the nitrate and nitrite averages for field samples were 71.08 and 0.11 ppm. Corresponding values in control samples were 29.90 and 0.03 ppm, respectively.

Among the leafy vegetables, higher nitrate average was observed in spinach (Spinacea oleracea), i.e. 71.83 ppm compared to 'methi' in which the nitrate content was 67.78 ppm. The range of nitrates in spinach was 35.00 to 93.00 ppm and was 39.00 to 87.50 ppm in 'methi' (Trigonella graecum). Considering nitrites, their average was higher in 'methi' (0.11 ppm) than in spinach (0.08 ppm). The higher nitrite content of 'methi' might be due to higher activity of nitrate reductase, however, in all other vegetables increase in nitrates was accompanied by a proportionate increase in nitrite content.

Cauliflower (Brassica oleracea Var. botrytis) nitrate values ranged between 26.00 to 68.00 ppm with an average of 50.55 ppm, whereas the nitrite values ranged between 0.02 to 0.15 ppm with an average of 0.08 ppm. The nitrates present in soil and irrigation water also affected the amount of nitrates in the vegetables. The use of fertilizers effected an increase in nitrate and nitrite contents of vegetables.

The values of nitrates and nitrites observed in the fresh vegetables when compared with those levels as permitted by WHO, seemed to be within safe limits. In such areas where nitrates /nitrites in water are higher than the permissible levels even vegetables containing lower amounts of nitrates and nitrites may be hazardous.

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