# DETERMINATION OF NITRATE IN PLANT TISSUE

The nitrate in plant tissue is extracted by shaking with distilled water in the presence of an ion exchange resin. Chloride is a relatively high interference for the nitrate ISE so an additional sample conditioning may be necessary to minimise any chloride interference.

**Equipment Required**

1. Ion Meter, pH/mV Analyzer, or pH Meter with millivolt scale
2. Nitrate Combination Ion Selective Electrode
3. Beakers
4. Test tubes
5. Stoppered Erlenmeyer Flasks
6. Filter paper
7. Funnel
8. Glass tubing

**Reagents Required**

1. Dowex 50-X8 (50-100 mesh) hydrogen-saturated resin
2. Aluminium Sulphate $Al_2(SO_4)$
3. Dilute Barium Chloride $BaCl_2$
4. Silver Nitrate $AgNO_3$
5. Phenylmercuric Acetate
6. Dioxane
7. Sodium Chloride NaCl
8. Ionic Strength Adjustment Buffer (ISAB)
9. 1000ppm Nitrate standard

**Aluminium Resin**

Weigh out a known amount of Dowex 50-X8 (50-100 mesh) hydrogen-saturated resin and transfer to a beaker. Add 2.2g of $Al_2(SO_4)$, per 10g of resin. Make a slurry by adding a small amount of distilled water. Filter the mixture under suction or by gravity. Test for excess aluminium salt by rinsing the mixture in the funnel with distilled water. Transfer a sample of the filtrate to a test tube and add 12 drops of dilute $BaCl_2$: If precipitate forms, salt is still present in the resin mixture repeat the rinsing and testing until no precipitate forms. Store in a stoppered glass bottle.

**Silver Resin**

If plant tissue samples have a chloride level greater than 2% by weight, and a nitrate level less than 500 ppm $NO_3^-$. The addition of silver resin to the sample will remove chloride levels up to 6%. The silver resin is prepared in the same way as the aluminium resin, except that 7g of $AgNO_3$, are added per 10g of resin, in place of the $Al_2(SO_4)$: To test for excess silver salts in the mixture, rinse with distilled water. Add a small amount of NaCl to the filtrate. If no precipitate forms, the resin is salt free. If precipitate does form, repeat the rinsing and testing until no precipitate forms.

**Preservation Solution**

Dissolve 0.1g of phenylmercuric acetate in 20 ml of dioxane. Dilute to 100 ml with distilled water. Add 1ml of this solution to each litre of distilled water used to prepare all samples and standards.

Prepare standards of 100, 10 and 1 ppm by serial dilution of the 1000 ppm stock solution in distilled water and add 1ml of ISAB per 100ml of standard.

**Sample Preparation**

Dry a suitable quantity of plant tissue sample in an air-forced furnace as explained in Procedure No. 6.002 (a) of the Official Methods of the Association of Official Agricultural Chemists.

Weigh out 0.400g of dried, ground plant tissue and transfer to 125ml Erlenmeyer flask. Add 50ml of distilled water to the flask. Using 6mm glass tubing, collect approximately 1.5ml of aluminium resin in the tube by pressing the tube upright into the resin. Dispense the resin into the Erlenmeyer flask. (Repeat this procedure for the silver resin, if required due to chloride interference). Stopper flask and shake or stir for ten minutes. Filter the suspension through folded filter paper and collect the filtrate in a 100ml beaker and add 1ml of ISAB.

**Method**

Immerse the electrodes in each of the standards starting with the lowest and in increasing concentration steps, rinsing the electrodes with distilled water between standards. Plot a graph on lin/log graph paper of mV response against standard concentration. Immerse the electrodes in the sample, record the mV response and plot sample concentration from the graph.

**Reference**

*'Nitrate Determination in Plant Extracts by the Nitrate Electrode Carison, R.M., J. Ag. Food Chem., 1968, 16(5) 766*