NUCLEAR TECHNIQUES USED IN AGRICULTURAL RESEARCH IN TURKEY

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In this paper the information about the nuclear techniques will be presented. Also information about the research center in Ankara where these nuclear techniques are used in agricultuire.will be given.

I) NUCLEAR TECHNIQUES IN USE

Nuclear techniques used in agriculture can be grouped as: a.) techniques for monitoring and assessing the environmental pollution b.) techniques for reducing the environmental impact of increased productivity c.) techniques for resource development. Detailed information about these groups can help to understand the useage of nuclear techniques better.

a.) Techniques for monitoring and assessing the environmental pollution :

These techniques include the analysis of non-radioactive and radioactive pollutants using Cs-137; the monitoring of the pesticide residues in the food and the environment using C-14; the investigation of the plant root systems using. P-32,and P-33; investigating the climate chnges through isotope in precipitation and investigation of the effects of hormones in plants

b**) Techniques for reducing the environmental** :

These techniques include the impact of increased productivity; the sterile insect technique (SIT); the studies of N- fixation in crops using N-15 ; and the use of tracers for optimizing fertilizer uses fertilizer type,

1. Fertilizer Usaeage

Optimizing the fertilizer useage can be done by investigating :

- the application rate and method)- the application depth and time,
- residual effects of fertilizers,
- plant uptake of nutrients
- fertilizer distributions within the plant
- plant availablenutrients in the soil and their movement in the soil profile
- dentifying plant genotype responses to fertilizers(i.e. N-15, P-32, Mn-54, Zn-65, Fe-59, S-35, Cu- 64, Ca-45,)

2. Soil Water

- Measuring the soil water by neutron probe ,
- Movement of soil water in the
- Soil profile, leaching in soils ,soil
- Moisture characteristic curves of soils

c.) Techniques for resource development

- the use of isotopes for studying the origin and the flow
- of water (O-18, Cl-36)
- the use of radiation mutation for obtaining better crops (Co-60, Cs-137)

Important Isotopes that are oftenly used are :

A) STABLE ISOTOPES

H-2 (0.0156 %) H-1 (99.9844 %)
N-15 (0.367 %) N-14 (99.637 %)
C-13 (1.108 %) C-12 (98.812 %)
S-36 (0.02 %)
S-34 (4.22 %) S-32 (95.02 %)
S-33 (o.75 %)

B.) RADIOISOTOPES

P-32 (14.3 days , beta)P-33 (25.0 days , beta)
K-42 (12.4 hours, beta and gamma)
Ca-45 (165.0 days, beta)
Mg-28 (21.3 hours, beta and gamma)
S-35 (87.0 days , beta)
Fe-59 (45.6 days, beta)
Cu-64 (12.8 hours, beta and gamma) Cu-67(58.5 h)
Mn-52 (5.7 days, band g) Mn-54 (314 days, beta)
Zn-65 (245.0 days, beta and gamma)
Na-24 (15 hours, beta and gamma)
Cl-36 (3.08 years, beta
Co-60 (5.3 years, beta and gamma)
Cs-137 30.0 years, beta and gamma)
I-131 (8.05 days, beta and gamma)

II.) ANKARA NUCLEAR AGRICULTURE AND ANIMAL SCIENCES RESEARCH CENTER

This center has two departments :

A.) RADIATION APPLICATION DEPARTMENT

B.) RADIOBIOLOGY DEPARTMENT

-Detailed information about the departments are as follows :

A.) RADIATION APPLICATION DEPARTMENT

This department has two sections

- Soil Fertility and Plant Nutrition Investigations
- Plant Protection Investigations

Ultimate goal of the Soil Fertility and Plant Nutrition investigations is to use the soil and water resources of our country efficiently in obtaining higher crop yields while increasing the quality; so that sustainability in agriculture be achieved

In this respect:

- Availability of the macro and micro plant nutrient status of our soils are investigated
- Optimum fertilizer and water requirements of crops for high yields are investigated ,
- Determination of N-fixation capacities of legumes are done,
- Residues of agricultural chemicals in the environment are determined.

Ultimate goal of the plant protection research

- is to reduce the influence of the diseases and insects to a minimum at plant growth and after harvest upto consumption.

Plant Protection Research involves :

- To determine the sterility and lethal doses for the harmful insects
- To control the disease and insects at different stages of plant production and after harvest
- Pesticide residue determinations in food

B.) RADIOBIOLOGY DEPARTMENT

-Plant Breeding Investigations

-Tissue Culture Investigations

Ultimate goal of the Plant Breeding

Investigations are used to obtain

- high yielding,
- resistant to diseases and insects,
- high in N - fixation capacity
- high in oil and protein content
- suitable for machine harvest
- crop varieties by using the nuclear and modern techniques.

Mutation Investigations are:

- to determine the suitable irradiation dose for different crops,
- to obtain and improve a semi- draft barley for beer making,
- to improve the properties rye,
- to obtain and improve new wheat, chickpea, soybean, flax and mutant varieties
- Cytological work in soybean, rye, cotton and barley for finding out the chromosomal abnormalities.
- to obtain different morphological types in *Salx babylonica*

Goal of the Tissue-Culture Studies are

- shorten the time in mutation breeding
- by overcoming the genetical and biological problems that are encountered during mutational work

Tissue Culture Studies:

- Anther - Culture (barley, wheat, rapeseed)
- Immature-Embrio (wheat)
- Double -haploid (wheat)
- Tissue-culture studies with melon, cucumber,and garlic