A RED-ROT RESISTANT MUTANT OF SUGARCANE INDUCED BY GAMMA IRRADIATION

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ABSTRACT

Sugarcane variety Co. 449 is highly susceptible to strain D of the red-rot pathogen, *Glomerella tucumanensis*. This precludes the variety from being cultivated in northern India where the disease takes a heavy toll. Plants obtained from vegetative buds exposed to 500 r, 1000 r, 2000 r, 3000 r, 4000 r, 5000 r and 10,000 r of gamma radiation from a cobalt 60 source were inoculated with the D strain. One plant each from the vegetative progeny of buds subjected to dosages of 500 r and 3000 r were found to be resistant while all the others (an average of about 1,500 for each dosage) were susceptible. The mutant clones were morphologically indistinguishable from the original variety and possessed its other agronomic attributes also. These selections were made from individual inoculation and study of about 65,000 stalks of the sugarcane variety. Both the mutant clones arose from the third bud of the cane arising from the irradiated bud. The interesting fact that mutations almost invariably seem to appear in buds 3 to 7 of the cane arising from the mutation treated bud is believed to be the result of diplontic selection.

INTRODUCTION

The facts that radiations and radiomimetic chemicals can induce mutations and that all genes in an organism are liable to mutate, have held out hopes that resistance to a given disease may be obtained through techniques employing these agencies without accompanying adverse changes. Examples of resistance induced by mutagenic radiations are to victoria blight (Frey, 1955) and stem rust and crown rust (Frey and Browning, 1955) in oats, to stem rust (Myers et al., 1956) and stripe rust (Konzac et al., 1956) in wheat, and to rust in flax (Flor, 1955). In India Jacob (1955) has reported resistance to gall fly in Sesame induced by X-rays. Gregory (1956) obtained mutants of peanuts, following irradiation with 18,500 r and 15,000 r doses of X-rays, with resistance to two contrasting types of disease—a highly species-
specific disease, viz., leaf spot caused by *Cercospora personata* and a highly species-general disease, viz., stem rot caused by *Sclerotium rolfsii* which affects a wide spectrum of hosts. Interesting changes in the resistance of populations of almond and peach to crown gall and bacterial canker following thermal neutron irradiation were obtained by De Vay *et al.* (1965). An example of resistant mutants obtained by irradiating vegetative cuttings is the production of mutants of European black current (*Ribes nigrum*) resistant to the white pine blister rust (*Cronartium ribicola*) (Bauer, 1957).

A number of morphological mutations have been reported in sugarcane by various workers. Rao (1954) obtained an increase in the colour range of stripes and differences in flowering propensity following exposure of buds of a striped variety of sugarcane to X-rays. Tysdal (1956) exposed sugarcane to gamma irradiation and got mutants with shortened internodes and stripes on one internode. His results suggested that a dosage in excess of 4000 r would be lethal. On the other hand, Panje and Prasad (1959) found that the lethal range was in the region of 14,000 r. Vijayalakshmi and Rao (1960) subjected buds of different species of *Saccharum* and hybrid varieties to exposure to doses of gamma irradiation of 500 r, 1000 r, 2000 r, 3000 r, 4000 r, 5000 r and 10,000 r from a Co⁶⁰ source. They concluded that the upper limit of safe dosage for normal germination and growth of *Saccharum* material would in general be 3,000 r. They observed no visible mutation except stripes on the leaf and leaf sheath in shoots of Mungo exposed to 3,000 r and 4,000 r.

The variety Co. 449 is a medium-late season variety which has been cultivated over a large area for a number of years in the States of Andhra Pradesh and Madras. It does not, however, enjoy this popularity in northern India. One drawback of this variety is the high degree of its susceptibility to derivatives of the widely prevalent strain D of the red-rot pathogen, *Glomerella tucumanensis*, although it is resistant to other less common strains like ‘I’ and I.A.R.I. 244 (Srinivasan, 1961). Vijayalakshmi and Rao (*loc. cit.*) had included buds of Co. 449 in their study. No visible morphological changes were obtained. Plants grown from irradiated material kindly made available by them were used for investigating the presence of red-rot resistant mutants.

**EXPERIMENTAL**

Twelve buds each had been subjected to gamma irradiation at each dose studied. The canes obtained from the irradiated material were cut