Induced mutations are being used for the study of development patterns in higher plants. In short duration rice varieties, the tillering system comprises of the main shoot primaries and secondaries. The frequencies of emergence and yield of mutations might differ in these different tiller categories. Studies on the pattern of tiller emergence and mutation frequency in the various ear categories have relevance to selection in the $M_1$ generation in mutation breeding programmes.

Materials and Methods

Seeds of the rice variety 'Rohini' were treated with 2 doses each of gamma rays (15 and 25 krad) and ethyl methane sulphonate (1 and 2%). Large seeds of uniform size and maturity were selected for the treatment. Sprouted seeds were down on soil surface. Irrigation during the early stages was regulated to avoid water stagnation.

The tillers on $M_1$ plants were classified according to the system adopted by Jacobsen (1966) in barley. The main shoot was marked 'A' and the coleoptile 'C'. Primary and secondary tillers were marked according to their node position on the main and primary shoots respectively. The secondary tillers were marked separately in each of the primaries. The tillers were labelled with threads of different colours as and when they emerged. The threads were later replaced by paper labels. All the primary tillers and secondaries up to the fifth position in each of the primaries were labelled in all the surviving $M_1$ plants. The labels were transferred to the respective panicles after flowering. The ears on maturity were harvested separately. The $M_2$ generation was raised on ear progeny basis. The $M_1$ ears were sown separately and scored for chlorophyll mutations. Normal seedlings and mutants in segregating progenies were separately counted and recorded. The data were tabulated and analysed.

Results and Discussion

The data on emergence of tillers are presented in Table 1. The frequencies of emergence for the various categories of tillers were different. The main shoot developed with the highest frequency followed by the primaries and the secondaries. Similar results were reported by Osone (1963) in rice.
Jacobsen (1966) in barley and Khan and Doll (1968) in wheat. Primary tillers showed variable degrees of emergence indicating that all the tillers of a plant did not develop equal frequency. Tillers in the axils of the coleoptile and the first primary leaf did not develop even under favourable conditions. Constantin and Mullenax (1966) reported that in rice a coleoptilar bud is neither present in the embryo nor appears throughout the development of the plant. The frequency of emergence of primary tillers increased up to the fourth and thereafter gradually decreased. Thus among the primary tillers of a rice plant, the fourth developed most frequently (92.44%). Jacobsen (1966) on the other hand reported that the first primary had the highest frequency of emergence in barley. Early primaries developed more secondaries than later ones. Osone (1963) in rice and Jacobsen (1966) in barley also reported similar results. The first secondary of lower primaries rarely developed. Later secondaries regularly developed in early primaries but not in later ones.

<table>
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<tr>
<th>Category of tiller</th>
<th>No. of plants studied</th>
<th>No. of plants having the primary</th>
<th>Percentage of plants having the primary</th>
<th>No. of plants having the secondary</th>
<th>Percentage of plants having the secondary</th>
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<tr>
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<td>92.44</td>
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Table 1 Frequency of emergence of primary and secondary tillers in rice
Mutation frequencies estimated as number of mutations per 100M_1 ears for the main ear, primary ears and secondary ears are presented in Table 2. The frequency for the main ear did not differ appreciably from that of primary. Karunakaran and Varkey (1977) reported that the first 3 ears on M_1 plants did not show any significant difference in M_2 chlorophyll mutation yields. Khan and Doll (1968) reported similar results in wheat. On the other hand Osone (1963) observed that later tillers in rice showed a decrease in the M_2 mutant frequency. Mutation frequencies of secondary groups (4) and (5) were higher than those of the respective primaries. Frydenberg and Jacobsen (1966) in barley reported that all primaries except the third mutated more frequently than their corresponding secondaries.

The M_2 segregation ratios of the various ear categories are presented in Table 2. The ratios for the main ear in primaries were mostly similar but that of the secondaries was higher. This high segregation ratio indicates that secondary ears are derived from smaller number of initial cells. Osone (1963) reporting high segregation ratios for later tillers in rice has stated that the initial cells leading to the formation of secondary tillers consist of a part of the cells leading to the formation of the primary ones.

Summary

Rice seeds were treated with two doses each of gamma rays and EMS. The tillers on M_1 plants were classified according to their node positions. The frequencies of emergence for the various tiller categories were estimated. The M_2 generation was raised as M_1 ear progenies. Chlorophyll mutation frequency and segregation ratio were estimated in the different ear categories. The frequencies of emergence for the various categories of tillers were different. The main shoot developed with the highest frequency followed by the primaries and the secondaries. Tillers in the axils of the coleoptile and the first primary leaf did not normally develop. The frequency of emergence of primary tillers increased up to the fourth and thereafter gradually decreased. Early primaries developed more secondaries than later ones.

Mutation frequency of the main ear did not differ appreciably from that of primary ears. Secondary groups (4) and (5) mutated more frequently than the respective primaries. The segregation ratios for the main ear and primaries were mostly similar. The ratios for the secondaries were higher. This high segregation ratio indicates that secondary ears are derived from smaller number of initial cells.
Table 2: Chlorophyll mutation frequency and segregation ratio in the different ear categories of rice

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<th>Ear category</th>
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<th>Segregation ratio</th>
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<td>No. of progenies segregating</td>
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* All secondary ears in a primary group.
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REFERENCES


(M. S. Received: 10-6-1978)