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Mutagenic activity of sodium bisulphite in barley

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Summary. Sodium bisulphite (7 and 10 mM) treatments administered at 30 °C for 6 h have been found to be strongly mutagenic in barley.

Sodium bisulphite is commonly used as bacterial inhibitor in wine, fermented beverages, fruit juices and as a preservative in dried fruits. In recent years, considerable evidence has been gathered to show that bisulphite (sulphur dioxide), even at low concentration, is a strong environmental pollutant. A strong statistical correlation has also been established between the SO_2 pollution level and several human diseases, including various types of cancer[1]. Bisulphite has also been reported to be mutagenic in some microbial systems[2-5].

The present communication reports the mutagenic activity of bisulphite in a higher plant system. Solutions of sodium bisulphite made in distilled water were freshly prepared to final concentration of 7 and 10 mM. Caryopsis of barley (*Hordeum vulgare* var. NP-114) were used as test system. For each treatment, repeated thrice, 50 seeds were taken in conical flasks and treated with 25 ml of the chemical. The treatments were given at 30 °C for 6 h. At the end of the treatment, seeds were given a quick wash with tap water and planted in glass petridishes on moist filter papers for germination and measuring seedlings injury, which was recorded on 10th day of planting. Another batch of similarly treated seeds was sown in the experimental nursery to raise M_1-generation. Spikes of M_1-plants harvested at maturity were sown in nursery for mutation analysis and M_2-seedlings were raised for scoring chlorophyll deficient mutations.

The data presented in the table show that sulphite produces significant reduction in seedling height, resulting in upto 40% of seedling injury. M_2-generation was grown on M_1-spike basis and the frequency of M_1-spikes segregating for chlorophyll-deficient mutations and M_2-mutant seedlings was worked out. The frequency of M_1 spikes segregating for mutations ranged from 17 to 24.1%, whereas the frequency of M_2-mutant seedlings ranged between 0.8 and 2.3%. The types of mutations recorded included Albina, Viridis and Alboviridis. The last class being the most prominent.

The data presented show that sulphite is a strong mutagen in barley and could be equally efficient in other higher plants. At the chemical level, it is a very reactive substance and undergoes various types of reaction with the cellular apparatus, which may include deamination of cytosine, transamination, cross-linking of proteins and nucleic acids and free radical reactions leading to production of mutations[1,6-9].

Effect of sodium bisulphite on seedling injury and chlorophyll mutations in barley

Treatment	Seedlings height (cm)	M_1-spikes tested	Mutation/100 M_1-spikes	M_2-seedlings tested	Mutations/100 M_2-seedlings
Control	10.2±0.3	163	–	2044	–
Sodium bisulphite					
7 mM	6.8±0.6		17.0	2133	0.8
10 mM	6.1±0.3		24.1	3409	2.3

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