

## Effect of Thiourea on Growth and Yield of Foxtail Millet

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**Abstract** In foxtail millet (*Setaria italica* (L.) Beauv.) seed-soaking with thiourea (500 and 1000 ppm) significantly increased growth and grain yield. Foliar sprays of mercaptoethanol and thiourea increased grain yield by 26.9 and 33.7 per cent, respectively, over control. Significant improvement in harvest index was noted with these two chemicals, but straw and biological yields remained unaltered. Since, foliar spray of urea (1000 ppm) did not have any effect, the effects of thiourea are largely attributed to a function of sulphhydryl group.

**Key words** *Setaria italica*, dry matter partitioning, grain production, sulphhydryl group, thiourea.

Poor seedling vigour is one of the reasons for low productivity of foxtail millet. Thus, it is obvious that improvement of seedling vigour in the initial growth period of foxtail millet may ensure early ground cover and hence attainment of leaf area needed for maximum radiation interception. Use of growth regulating substances, viz., thiourea (Mayer 1956 and Sahu *et al.* 1993) might be helpful in this regard.

In plants, thiourea is mainly known for dormancy breaking and germination-stimulating effects (Mayer & Poljakoff-Mayber 1958), but may have more diverse biological activities of SH group. Sahu & Solanki (1991) reported that foliar sprays of sulphhydryl compounds, i.e., mercaptoethanol and thiourea @ 0.1 per cent, at grain development stage significantly increased grain yield and harvest index of maize. In view of these, we assessed the efficacy of thiourea as seed and foliar treatments for improving grain production in foxtail millet.

### Materials and Methods

A field experiment, under rainfed condition, was conducted at Adaptive Trial Centre, Chittorgarh, during *kharif* 1993. There were three seed treatments, viz., control, thiourea (500 and 1000 ppm), and four foliar treatments, viz., control, 1000 ppm urea, 1000 ppm 2-mercaptoethanol and 1000 ppm thiourea. Twelve treatment com-

binations (3 seed treatments x 4 foliar treatments) were replicated thrice, and placed in randomized block design, on medium black calcareous soil of low fertility. Foxtail millet (*Setaria italica* (L.) Beauv.) var. SIA- 326, was sown on 2 July, with 40 kg N ha<sup>-1</sup> and 30 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and harvested in the last week of September. Seeds soaked for 10 h were dried in shade for 3 h. While applying the spray treatments, Teepol (0.05 m L<sup>-1</sup>), a spreading agent, was mixed with the spray solution. The crop was sprayed at 60 days after sowing (DAS), i.e., grain development stage and then again at 70 DAS. Harvest index (HI) was calculated from (economic yield /biological yield) x 100.

### Results and Discussion

Seed soaking with thiourea (500 and 1000 ppm) significantly increased the plant height at 30 and 75 DAS, dry matter and LAI at 75 DAS in comparison to control (Table 1). Further, thiourea significantly increased yield attributes and yield over control (Table 2). Both concentrations of thiourea were at par in all the characters. The increase in yield might be due to initial spurt in growth, due to seed-soaking, as evidenced by growth characters, i.e., plant height, dry matter and LAI. Similarly, Sahu *et al.* (1993) reported significant effect of thiourea (seed-soaking) on growth and yield of maize.

**Table 1** Growth characters of foxtail millet at 30 and 75 days after sowing (DAS)

Treatments	Plant height (cm)		Dry matter (g plant <sup>-1</sup> )		LAI 75 DAS	Dry matter distribution (%) at 75 DAS		
	30 DAS	75 DAS	30 DAS	75 DAS		Stem	Leaves	Ear
<b>Seed treatments</b>								
Control	33.8	82.8	4.2	8.9	2.2	53.7	17.8	28.5
Thiourea (500 ppm)	39.0	93.4	5.6	13.2	2.7	50.1	20.3	29.6
Thiourea (1000 ppm)	39.1	95.4	5.9	13.9	3.0	48.7	20.8	30.5
CD 5%	1.6	10.4	0.6	2.3	0.5	0.5	NS	NS
<b>Foliar treatments</b>								
Control	—	89.3	—	11.8	2.4	54.0	19.2	26.8
Urea (1000 ppm)	—	88.3	—	11.8	2.5	53.7	19.5	26.8
Mercaptoethanol (1000 ppm)	—	91.7	—	12.1	2.7	48.1	19.7	32.2
Thiourea (1000 ppm)	—	90.9	—	12.3	2.8	47.6	20.0	32.4
CD 5%	—	NS	—	NS	NS	0.6	NS	4.2

NS — Non-significant

Foliar sprays of mercaptoethanol and thiourea significantly increased dry matter distribution in ear, and reduced in stem, over control and urea spray (Table 1). Foliar sprays of mercaptoethanol and thiourea significantly increased yield attributes over control (Table 2). Mercaptoethanol and thiourea significantly increased grain yield by 26.9 and 33.7 per cent, respectively, over control. Urea spray did not significantly influence yield attributes and yield. Straw and biological yields were not significantly influenced by these chemicals. HI, an indicator of dry matter partitioning for grain yield improved significantly

by mercaptoethanol and thiourea. Thus, results revealed that SH compounds (mercaptoethanol and thiourea), have a role in improving DM distribution for grain yield, as evidenced by a significant improvement in HI and DM distribution in plants at 75 DAS. Grain yield was also significantly and positively correlated with HI ( $r=0.86$ ). Lack of response of urea spray in equivalent concentration clearly demonstrated that the biological activity of thiourea is not a major function of its  $\text{NH}_2$  group, but it is due to SH group (Sahu & Solanki 1991). Bokarev & Satarova (1957) had also concluded that the

**Table 2** Yield attributes and yield of foxtail millet

Treatments	Ear length (cm)	Ear girth (cm)	1000-grain wt. (g)	Grain yield (kg ha <sup>-1</sup> )	Straw yield (kg ha <sup>-1</sup> )	Biological yield (kg ha <sup>-1</sup> )	Harvest index (%)
<b>Seed treatments</b>							
Control	19.8	4.2	2.6	926	2262	3186	28.8
Thiourea (500 ppm)	25.6	5.1	2.9	1116	2678	3794	29.2
Thiourea (1000 ppm)	26.9	5.2	2.9	1237	2908	4144	29.6
CD 5%	2.5	0.3	0.2	185	340	511	NS
<b>Foliar treatments</b>							
Control	22.5	4.6	2.5	952	2579	3531	26.8
Urea (1000 ppm)	22.4	4.6	2.6	937	2648	3585	26.0
Mercaptoethanol (1000 ppm)	25.7	5.1	2.9	1208	2640	3848	31.3
Thiourea (1000 ppm)	26.8	5.2	2.9	1273	2596	3869	32.8
CD 5%	2.7	0.4	0.2	214	NS	NS	2.1

activity of thiourea in breaking dormancy of potato tubers depends on its ability to isomerize to a form with a sulphhydryl group whose presence is necessary for an active compound. The interaction of seed treatments and foliar treatments was not statistically significant in all the characters.

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