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# Crop and resource management

## Physiology and plant nutrition

### \* Chemical composition and digestibility of urea-treated rice straw

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The straw of seven rice cultivars, grown during 1993 under uniform agronomic conditions, were treated with 3%, 4%, or no urea. Their chemical composition (Table 1), nylon bag organic matter digestibility (NBOMD), and nylon bag neutral detergent fiber digestibility (NBNDFFD) were determined (Table 2).

The crude protein (CP) content in untreated Basmati 370, Sita, Cauvery, Pant Dhan 6, and Saket 4 was higher than that in Pusa Basmati and Kasturi (Table 1). The ash content in untreated cultivars

Saket 4, Kasturi, and Pant Dhan 6 was more than the mean value of 151 g/kg dry matter (DM). The neutral detergent fiber (NDF) content in the untreated straw varied from 728 to 778 g/kg DM.

Treating straw with urea increased ash content and decreased organic matter (OM) content of straw. Straw with a higher ash content has a lower energy value. The NDF content increased in cultivars Kasturi and Pusa Basmati, whereas in the others it declined when treated with 3% urea and even more with 4% urea. Treating with 3% urea increased the CP content to 119 g/kg DM and with 4% to 136 g/kg DM.

The NBOMD and NBNDFFD of straw from the cultivars differed significantly (Table 2). There was no significant difference between 3 and 4% urea treatments. The improvement in digestibility was greater in straw that had lower digestibility prior to urea treatment.

The relationship between NBNDFFD of treated straw (Y) and NBNDFFD of untreated straw (x) was  $Y = 788 - 1.35x$  ( $r^2 = 0.76$ ,  $n = 7$ ) for 3% urea-treated straw and  $Y = 681 - 1.15x$  ( $r^2 = 0.75$ ,  $n = 7$ ) for 4% urea-treated straw. This emphasized that for increased profitability, rice straw with higher digestibility may be fed to animals without urea treatment. ■

### Effect of root pruning during ripening on grain filling in rice

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The positive contribution of roots during the ripening phase to grain filling has been suggested in many reports. However, the discussion seems to have been speculative, with higher yield sometimes being observed where most of the roots are black and necrotic at ripening.

**Table 1. Differences in chemical composition of straw of cultivars untreated and treated with urea (g/kg DM). Uttar Pradesh, India. 1993.**

Variety	Untreated			3% urea-treated			4% urea-treated		
	Ash	NDF	CP	Ash	NDF	CP	Ash	NDF	CP
Basmati 370	129	763	54	142	755	113	136	768	140
Pusa Basmati	148	778	46	154	810	106	157	768	125
Sita	142	728	65	159	768	130	157	748	145
Kasturi	161	768	49	165	810	121	164	753	137
Cavery	158	763	37	162	731	133	151	751	141
Pant Dhan 6	158	752	68	170	747	109	158	727	130
Saket 4	170	737	70	181	738	121	170	723	136
Mean	151	755	61	162	765	119	156	748	136

**Table 2. Nylon bag organic matter digestibility (NBOMD) and nylon bag neutral detergent fiber digestibility (NBNDFD) (72h) of rice straw of different cultivars. Uttar Pradesh, India. 1993.**

Variety	NBOMD (g/kg)			NBNDFD (g/kg)		
	Unit	3% urea-treated	4% urea-treated	Unit	3% urea-treated	4% urea-treated
Sita	547	653	680	439	634	615
Pusa Basmati	573	669	698	496	627	652
Kasturi	570	676	669	519	640	606
Pant Dhan 6	596	684	665	507	620	584
Saket 4	584	658	667	493	576	590
Basmati 370	597	645	651	523	579	605
Cavery	615	663	670	540	588	604
Mean ± SEM	582 ± 8.9	664	672	50.3 ± 34.0	605	608
CD (P = .01)	36.2			34.0		
CD (P = .05)	26.4			24.8		

We evaluated how roots contribute to grain filling when pruned at different times around heading. High-yielding semidwarf cultivar IR58 was transplanted at the beginning of Jul and Aug 1989 (wet season) at IRRI at a density of 50 hills/m<sup>2</sup>. We applied a total of 150 kg N/ha during the entire growing season. A sickle was used to prune, at night, all of the roots (at the base of the hill) for 20 plants in the middle of a 30-m<sup>2</sup> plot. Each pruned hill was lifted once into the air to ensure the plant was completely separated from the ground and then returned to the same place.

Each treated plant was tied to a stick inserted into the soil beside the hill. This kept the plants erect and avoided disturbances in the canopy structure from affecting grain filling. Roots were pruned at different times before and after heading with three replications. Grain yield and yield components were determined using conventional methods.

The sudden decrease of surface area for water absorption after pruning caused