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## Evaluation of Drought Tolerance in Some Rainfed Upland Rice Cultivars

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### Abstract

A large portion of the world's poor farm in rainfed systems where the water supply is unpredictable and droughts are common. Erratic rainfall distribution is the most limiting factor of growing upland rice in India. Genetic improvement of drought tolerance in crop plants needs identification of relevant physiological stress tolerance mechanisms as selection criteria. We compared eight short duration upland rice cultivars using the Fischer and Maurer drought susceptibility index. Field experiments were conducted for five years (1996–2000) in the upland plots of the Agricultural Experimental Farm of the Indian Statistical Institute in Giridih, Jharkhand. Seven cultivars were obtained from the Central Upland Rainfed Rice research station in Hazaribagh (RR-167–982, Kalinga<sup>-3</sup>, RR-151–3, RR-55–1, RR-50–5, RR<sup>-2</sup>-6, Birsa-101) and one was locally grown (Brown Gora). Cultivars were grown in a complete randomised block design with 3 replications and each plot size about 30 m<sup>2</sup>.

Highest annual rainfall was recorded in 1997 with 1203 mm, while the lowest amount of rainfall was observed in 2000 with 633 mm. Number of days with rainfall ranged from 35 days in 2000 to 49 days in 1997 and 1999. Based on those climate data we considered 2000 as the only drought year. All cultivars yielded lowest in 2000 while maxim yield could be obtained in years were annual rainfall was high. The drought stress susceptibility index of the cultivars indicated that Brown Gora, Birsa-101, RR-151–3, RR-167–982, RR-50–5, and Kalinga<sup>-3</sup> were relatively drought tolerant. In contrast RR<sup>-2</sup>-6 and RR-51–1 were drought susceptible. The results indicate highest drought tolerance levels in the traditionally grown Brown Gora ( $S = 0.38$ ). However, the best variety with respect to yield in both environments (stress and no-stress conditions) indicated RR-167–982 as the best cultivar for the upland conditions.

In other experiments we could show, that the nitrogen status of the soil is closely related to the moisture regime in the soil. The lower the soil moisture content, the lower the nitrogen use efficiency in the plants. In general we conclude that in areas of uncertain moisture supply, nitrogen application rate should be reduced from that normally used for irrigated rice.

**Keywords:** Drought tolerance, India, nitrogen content, soil moisture, upland rice