

SHORT COMMUNICATION

EFFECT OF MAGNESIUM NITRATE ON NITROGEN METABOLISM
IN GERMINATING MAIZE (*ZEA MAYS* L.) SEED

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Soaking of maize seeds in 5 and 7.5 mM $Mg(NO_3)_2$ improved the germination and growth of radicle and plumule at 96 hrs. of germination. The soluble, insoluble and total nitrogen in plumule also increased. The insoluble and total nitrogen in the radicle however, decreased with increasing hrs. of germination. Plumule and radicle showed maximum activity of nitrate reductase with 7.5 and 10 mM $Mg(NO_3)_2$ treatments respectively.

Salts of magnesium (Mg) are reported to improve plant growth and development (Ananthanarayana and Rao, 1980; Fecenko, 1984; Kiss, 1989). There is hardly any report on the effect of $Mg(NO_3)_2$ on seed germination. The present study reports the effect of different concentrations of $Mg(NO_3)_2$ on some aspects of nitrogen metabolism in germinating seeds of maize.

One hundred seeds of *Zea mays* L. var. Tin Pakhia (developed at this centre) were soaked for 6 hrs in beakers containing 100 ml. $Mg(NO_3)_2$ solution of varying concentrations ranging from 0 to 25 mM. The soaked seeds were germinated for another 90 hrs. in petri dishes (dia 13 cm), lined with filter paper moistened with the respective $Mg(NO_3)_2$ solutions. These petri dishes were kept in diffused light at $30^\circ \pm 2^\circ C$.

Germination percentage, length and dry weight of plumule and radicle were recorded 48, 72 and 96 hrs after germination. Ethanol soluble and insoluble nitrogen in the dried samples were determined following modified Microkjeldahl method (Lang, 1958) Total nitrogen was calculated by adding both ethanol soluble and insoluble nitrogen. *In vivo* nitrate reductase activity in the plumule and radicle was determined by the method of Srivastava (1974). The colorimetric analysis were done using a Turner Model 380 Spectrophotometer. All the experiments were repeated thrice.

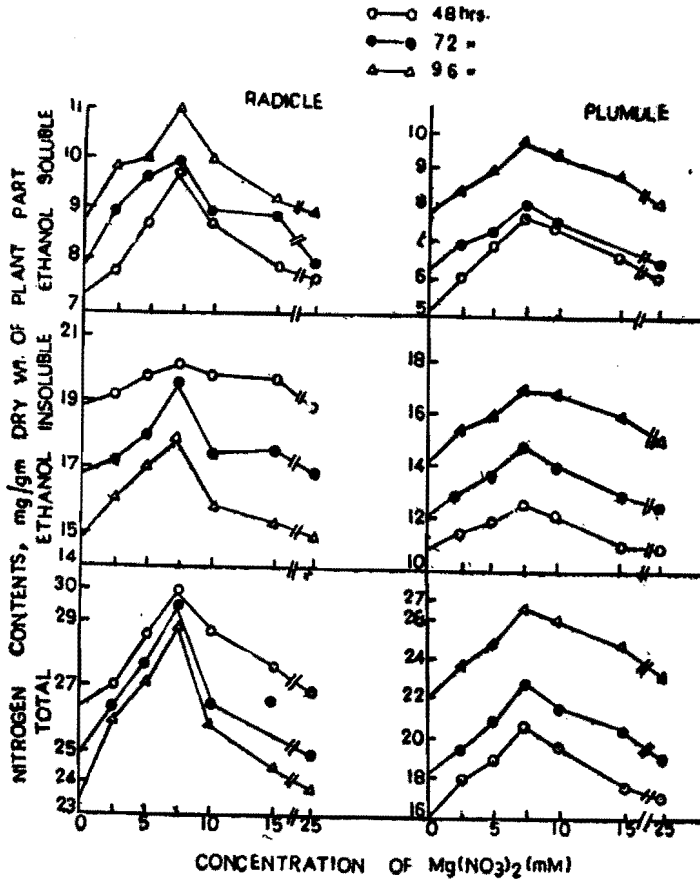


Fig. 1. Effect of different concentration of $Mg(NO_3)_2$ on nitrogen content of radicle and plumule of maize seeds at different hours of germination.

Maximum percentage of germination and growth of radicle and plumule were recorded at 7.5 mM concentration of $Mg(NO_3)_2$ (Table I). The ethanol soluble, insoluble and total nitrogen contents in radicle and plumule also increased at 7.5 mM $Mg(NO_3)_2$ and declined at higher concentrations. Insoluble and total nitrogen contents of radicle decreased with increasing hrs. of germination while soluble nitrogen showed an opposite trend. In plumule, all the three soluble, insoluble and total nitrogen were found highest at 96 hrs of germination while it was lowest at 48 hrs (Fig. 1). The maximum activities of nitrate reductase enzyme in plumule and radicle were recorded at 7.5 and 10 mM $Mg(NO_3)_2$ concentrations respectively, at 96 hrs of germination. Plumule always showed higher activity than radicle (Table I).

Table I. Effect of different concentrations of $Mg(NO_3)_2$ on percent germination, length (mm), dry weight (mg/seed) and nitrate reductase activity (n moles of $NO_2^- h^{-1} g^{-1}$ fr. wt.) of radicle and plumule of maize seeds at 96 hrs of germination

Concentration of $Mg(NO_3)_2$ (mM)	Germination percentage	Radicle		Plumule		NR-activity	
		Length	Dry wt.	Length	Dry wt.	Radicle	Plumule
0	80	74	6.1	55	16.4	150	164
2.5	85	82	7.6	62	19.2	—	—
5.0	92	83	8.9	68	20.3	170	224
7.5	95	82	9.3	68	21.2	226	294
10.0	87	78	8.8	64	20.0	254	288
15.0	85	77	7.1	57	19.9	234	284
25.0	82	74	6.7	56	18.7	176	254
C.D. at 5% level of significance	4	4	1.1	4	3.2	44	51

Bose *et al.* (1982) have shown earlier that the application of nitrogen (particularly nitrates) to the medium resulted in an increase in germination percentage of maize seeds. Fecencko (1984) reported that Mg increases the uptake of nitrogen and phosphorus in barley. Based on these observations, it may be speculated that magnesium increased the uptake of nitrate moiety of $Mg(NO_3)_2$ which in turn enhanced the rate of germination of maize seeds and also their further growth.

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