Indian J. Plant Physiol., Vol. XXXI, No. 4, pp, 407-409 (December, 1988)

SHORT COMMUNICATION

REEMERGENCE OF SORGHUM SEEDLINGS AND AMINO ACID C^{14} INCORPORATION

MADHURI SHARON*, A.K. MAITI AND P. SRINIVAS
(ICRISAT, Patancheru, A.P., INDIA)

(Received, February 8, 1988)

Incorporation of labelled amino acid C-14 in three varieties of sorghum; IS-13, IS-9327 and IS-3541 was studied. Varieties IS-13 and IS-9327 are capable of regermination, even after having an initial germination followed by a drying period of ten days. These two drying resistant varieties can incorporate more amino acid C-14, as compared to non resistant variety (IS-3541), which could not germinate after drying.

One of the major problem in crop establishment, in semi-arid tropics is a short period of rainfall just enough to initiate seed germination, followed by a dry weather, which kills the germinated seeds. But there are certain modern varieties of sorghum like IS-13 and IS-9327 which can regerminate even after drying period of ten days, when given the favourable conditions for germination.

Seeds are well equipped with all the information, proteins and enzymatic system for germination. An initial hydration of enzyme, proteins and synthesis of new proteins along with increased respiration and other hydrolytic functions during germination. The present paper is an attempt to find out the incorporation of labelled amino acid C-14 into protein synthesis (during first few hours of germination) for germinating seeds of different varieties of sorghum which can reemerge after an initial germination followed by a dry period.

Seeds of sorghum varieties IS-13 & IS-9327 (which could regerminate) and IS-3541 (which could not regerminate) soaked in distilled water at 25°C (+ 1°C) for 4 hours were allowed to germinate in a germinator at 35°C (+ 1°C) on moist saturated filter papers for 0, 12, 24, 35 and 40 hours. This will be called as first germination. These germinated seeds were then dried at 35°C (+ 1°C) for ten days and were incubated in a solution containing labelled amino acid C-14 mixture to study protein synthesis.

For studying the incorporation of amino acids into seed proteins, during initial hours of regermination. Ougham and Stoddard's (1985) method was used with some

*Present address : C.C.S.R.I., Excel Estate, Goregaon (West), Bombay.

modifications. Seeds were cut into two halves so that amino acids would be taken up by the metabolising tissues. Cutting was done in such a fashion that embryo remained unharmed. Ten seeds of each treatment were incubated in 1 ml of 20 mM Tris buffer pH 7.5, 5 mM $MgCl_2$ containing 0.03 mg/ml chloramphenicol (an antibiotic to inhibit bacterial protein synthesis) and 1 μCi/ml of a mixture of (U-C-14) amino acids (supplied by BARC). Incubation was carried out at 35°C for 16 hours. Treated seeds were then thoroughly rinsed with distilled water, drained, blotted and dried on air drier. Seeds were then homogenised with 1 ml of distilled water. A millipore assembly was prepared having cellulose nitrate membrane and on top of which a glass filter (GF/A) was mounted. Seed homogenate was filtered through this assembly. Glass fibre matrix (GF/A) was mounted to trap the particle matter and the nitro cellulose disc was used for binding water soluble protein. The glass fibre filter paper was then removed. Nitrocellulose disc was washed with buffer pH 7.1 and then with distilled water. It was air dried and then mounted in Packard tricarb scintillation counter and counted.

Varieties IS-13 and IS-9327 (which remained viable after initial drying of germinating seeds) show that they can incorporate more amino acids (Table I) even after having an initial first germination period of 40 hours. Whereas variety IS-3541

Table I. Incorporation of labelled amino acid C-14 into protein by sorghum strains after an initial germination for different periods, followed by a drying period of ten days and then reincubation of 16 hours

Sorghum variety	Hrs of initial germination	Incorporation of amino acids (cpm/seed) EXPERIMENTS				Mean	+S.D.	% amino acid incorporation
		1	2	3	4			
IS-13	0	1021	1099	1097	1075	1072	36.3	100
	12	882	917	907	902	902	14.7	87
	24	806	811	810	816	810	4.2	75
	35	576	580	574	574	576	2.8	53
	40	537	554	556	549	548	8.5	51
IS-9327	0	1384	1391	1379	1364	1379	11.5	100
	12	978	990	987	974	982	7.5	71
	24	824	998	972	968	940	8.8	66
	35	677	666	665	662	667	6.6	48
	40	508	517	512	504	510	5.2	37
IS-3541	0	1016	1028	1022	1020	1021	5.0	100
	12	392	400	399	392	395	4.4	38
	24	384	390	383	381	384	3.9	37
	35	291	298	298	294	295	3-0	29
	40	89	90	89	90	89	0.6	8

had very low percentage of amino acid incorporation into protein (as measured by cpm of C-14 labelled amino acids) during incubation. These results confirm the view that protein synthesis is a metabolic process highly susceptible to dryness.

Many reports are available on the existence of m-RNA in embryo of seeds (Brooker *et al* 1978, Payne 1976, Sanchez De Jimenez & Aguilar 1981 and Mayer & Marbach 1980) which are a must for the resumptiom of metabolic activity during germination. Peumans *et al* (1979) have suggested that m-RNA are superficially stored as ribonucleoprotein particle to ensure germination under unfavourable conditions. Moreover, very low incorporation of amino acids into protein by variety IS-3541 may be an indication that information in m RNA for protein synthesis get utilised during initial seed germination. It also reveals that resistant varieties like IS-13 and IS-9327 have more protein synthesizing information available than the varieties which can not germinate second time.

The primary aim of the work was to detect the differences in protein synthesis capacity between strains, the results of above experiments suggest that drying-resistant varieties can synthesize more protein.

ACKNOWLEDGEMENT

Authors wish to thank ICRIST for granting the fund and opportunity to carry out this work. A very special thanks is due to Late Mr. Anjaiah, for his assistance.

REFERENCES

Brooker J.D., Tamaszewski, and Marcus, A. (1978). Performed messenger RNAs and early wheat embryo germination. *Plant Physiol.* **61** : 145-149

Mayer A.M. and Marbach, J. (1980). Biochemistry of the transition from resisting to germinating state in seeds. In L. Reinhold J.B. Harbone, T. Sweein Eds. Progress in Photochemistry, Pergamon Press, Oxford.

Ougham H.J. and Stoodart J.L. (1985). Development of laboratory screening technique, based on embryo protein synthesis for the assessment of high temperature susceptibility durin germination of sorghum bicolor *Exptl. Agric.* **21** : 343-355.

Payne, P. (1976). The long lived messenger RNA of flowering plant seeds. *Biol. Rev.* **51** : 329-363.

Peumans, W.J., Caers, L.I. and Carlier A.R. (1979). Some aspects of synthesis of long lived messenger ribonucleus proteins in developing embryos. *Planta,* **144** : 485-490.

Sanchez De Jimenez E.R. Aguilar S. Lopez (1981). Distinctive characteristic of protein synthesis in maiz embryos during the early stages of germination, *Biochem. Biophys. Res. Commun.* **99** : 445-450.