NITRATE REDUCTASE IN WILD AND CULTIVATED WHEATS

RECENT studies on photosynthetic rates in wild and cultivated wheats have shown that the primitive wheats have higher photosynthetic rate than the cultivated types[1,2]. This behaviour was found to be true during vegetative phase even at the photophosphorylation level[3]. Tsunoda[4] has further shown that the photosynthetic rates are strongly correlated with leaf nitrogen. Croy and Hageman[5] have shown a strong correlation between the activity of nitrate reductase and total reduced nitrogen in wheat. Would then, selection for nitrate reductase help in selecting for high photosynthesis also? We here report the activity of nitrate reductase in diploid, tetraploid and hexaploid wheats grown under identical conditions. Twenty-eight genotypes, belonging to ten different species and including all the basic genomes of wheat, were raised in sand culture. Hoagland's nutrient solution at full strength was supplied at weekly interval[6]. Fully expanded leaves of one-month old seedlings were assayed for nitrate reductase using the *in vivo* method[7,8]. There were three replicates for each genotype and for each determination 200 mg leaf material obtained from several leaves was used. In a preliminary experiment the effect of glucose, sucrose and 3-phosphoglyceric acid was determined on the *in vivo* activity of nitrate reductase. Only 1% glucose was found effective in raising the NR activity. Therefore, NR activity in all genotypes was determined in the presence of glucose.

TABLE I

Nitrate reductase activtiy in vivo *in leaves in different genotypes of one-month old wheat seedlings*

Species	Genome	Culture (Code Name)	μmoles NO_2^-/g.f.w./h
T. monococcum	AA	..	4·92
T. speltoides	BB	..	4·33
T. tauschii	DD	..	5·64
T. carthlicum	AABB	Parent II	2·92
		5	2·80
		39854	2·92
T. dicoccum	AABB	NP 202	1·92
		Parent VIII	
T. durum	AABB	HD 4502	2·75
		NP 404	3·17
T. polonicum	AABB	Parent III	2·33
T. turanicum	AABB	Parent X	2·17
T. turgidum	AABB	18	2·75
		23	2·83
		24	2·50
		28	2·67
		43	2·67
		44	2·00
		50	2·33
		67	2·17
		68	2·25
		46432	2·92
		Lusitanium	2·08
		Parent V	
T. aestivum	AABBDD	Hira	2·25
		Kalyansona	2·17
		C-306	2·33
		Moti	2·58
		Karchia	2·33
		LSD at 5%	0·41

The highest enzyme activity was observed in three diploids *Triticum monococcum, T. speltoides* and *T. tauschii*. Amongst the 4 × types the lowest activity of 1·92 μmoles NO_2^- g^{-1} hr^{-1} was observed in *T. dicoccum* cv. NP 202, whereas the maximum was in *T. durum* cv NP 404 being 3·17 μmoles

NO_2^- g^{-1} hr^{-1}. Within one species such as *T. turoidum*, the variation was from 2·00 to 2·92 μmoles NO_2^- g^{-1} hr^{-1}. In *T. aestivum*, the enzyme activity just varied from 2·17 to 2·58 μmoles NO_2^- g^{-1} hr^1 .

Therefore, it appears that only the 2 × genotypes have higher NR activity than 4 × and 6 × genotypes. There does not exist any clear distinction between 4 × and 6 × types in this regard although they differ with respect to photosynthesis[1]. This study shows that close relationship between total nitrogen and photosynthesis may not have much to do with nitrate reductase activity. Accordingly, the NR activity cannot be made an indirect index of photosynthetic activity also.

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Water Technology Centre,
Indian Agri. Res. Institute,
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S. K. SINHA.
V. RAJAGOPAL.
V. BALASUBRAMANIAN.

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