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1. C^{14}- assimilations study.

Maize inbred lines, D-16, W37-A, and N-40 and one single cross hybrid F_1 (D-16 x W37-A) were tested for their respective capabilities in carbon assimilation. Three week old seedlings in lots of three were exposed to $C^{14}O_2$ for 10 minutes for each entry and the seedlings were quickly killed by submerging into liquid nitrogen.

Subsequent extractions were carried out with Ethanol, Chloroform, and each extract was tested for its radioactivity and dry weight. The residue was finely homogenized in a glass tissue-homogenizer and suspended in water for homogeneous dispersion so that samples of uniform thickness without substantial self-absorptions could be prepared from residues for radioactivity determinations.

Radioactivity (cpm, count per minute) and the specific activity (cpm/mg of solute) are presented in tables 1 and 2 and dry weights of each extract fraction in table 3. There were varietal differences among the inbreds and differences between the F_1 and its parental inbreds (D-16, W37A) in each extract fraction. The total carbon assimilated rates highest for the F_1 hybrid (table 1). However, in terms of specific activity (table 2), the F_1 hybrid gave a count of 21,834 cpm/mg, which is lower than either of its parental inbreds. This seems, at first, to indicate that the highest total carbon assimilated by the F_1 hybrid was due to its larger leaf area but probably not due to an elevated chloroplast activity by "heterosis of chloroplasts". However, when one examines the residue fractions in table 2 column 3, it is noticed that the F_1 gives a specific activity (3,822 cpm/mg) higher than either parent activity. Since the ethanol and $CHCl_3$ would extract most of the free sugars, amino acids, and fatty materials etc. from the samples, the residue fraction would consist of cellulose and high molecular weight polymers. This seems to indicate that the F_1 hybrid exhibited a high degree of efficiency in translocation as well as transformations from immediate low molecular weight photosynthetic products to higher polymers of plant constituents, as evidenced by its higher specific activity in the residue fractions (table 2). It is also noticed that the hybrid F_1 accumulated in its residue 9.5% of the total C^{14} assimilated during a 10 minute exposure, which is twice as much as the amount of C^{14} accumulated by either of its parents in their residue fractions, respectively.

Since the total dry weight consists of all of the constituents in the tested plants, it would be premature to make any definite conclusion as to the hybrid chloroplast activity until the isolated chloroplasts are examined and compared against those of their parental inbreds.

Table 1 Radioactivity of Samples (CPM)

Sample	Ethanol Extraction	%	$CHCl_3$ Extractions	%	Residue	%	Total CPM
	CPM		CPM		CPM		
D-16	3,695,642	93.28	96,000	2.42	170,068	4.29	3,961,710
W37A	3,594,992	90.33	153,025	3.84	231,856	5.83	3,979,874
F_1(D-16xW37A)	4,915,195	85.63	282,481	4.92	542,356	9.45	5,740,032
N-40	5,067,208	90.24	149,855	2.67	397,403	7.08	5,615,466

Table 2 Specific Activity of C^{14} in Samples (count/min./mg.)

Sample	Ethanol Extract	Chloroform Extract	Residue in H_2O	*Pooled Specific Activity
D-16	115,489	8,000	1,966	30,357
W37-A	76,489	5,668	2,482	23,775
F_1(D-16xW37A)	59,941	7,243	3,822	21,834
N-40	103,412	3,405	5,504	33,991

Each figure is average of 3 determinations

*Pooled specific activity is obtained by:

$$\frac{(SP)(DWS)\ ETOH + (SP)(DWS)\ CHCl_3 + (SP)(DWS)\ Res.}{\text{Total dry weight}} = \text{Pooled SP}$$

SP = Specific activity (Table 1)
DWS = Dry weight of the solute (Table 3)
ETOH = Ethanol
$CHCl_3$ = Chloroform
Res = Residue

Table 3 Dry Weight of Sample (MG)

Sample	Ethanol Extraction	%	$CHCl_3$ Extraction	%	Residue	%	Total Dry Weight
D-16	32 mg.	24.5	12 mg.	9.19	86.5 mg.	66.28	130.5 mg.
W37A	47	28.08	27	16.13	93.4	55.79	167.4
F_1(D-16xW37A)	82	31.19	39	14.83	141.9	53.97	262.9
N-40	49	29.66	44	26.63	72.2	43.70	165.2

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