PLANTING PATTERN AND LIGHT INTERCEPTION IN MAIZE

by

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Factors such as plant architecture, spatial arrangement and foliage formation can affect interception and distribution of solar radiation in a plant community.

We studied the effect of different planting configurations on interception and distribution of light within maize canopies. Rectangular and square planting configurations were compared at five population densities during the first and second growing seasons of 1974. Populations and spacing details are shown in Table 1.

TABLE 1.
SPATIAL ARRANGEMENT OF TWO PATTERNS OF PLANTING

Plant Pop. per hectare	Rectangular method (cm)	Square method (cm)
20,000	80 x 66	73 x 73
40,000	80 x 32	50 x 50
60,000	80 x 21	41 x 41
80,000	80 x 15	34 x 34
100,000	80 x 12	31 x 31

The amount of light intercepted and its distribution within the canopy was determined periodically commencing 30 days after emergence. Plants were also harvested for growth analysis.

Planting configuration had no effect on the degree of penetration nor on the amount of light intercepted within the canopy at the lowest population density (Table 2).

TABLE 2.
THE EFFECT OF PLANTING CONFIGURATION ON LIGHT DISTRIBUTION AND INTERCEPTION WITHIN MAIZE CANOPY

Plant per hectare	Above Ear		Below Ear		Ground level		Total interception	
	Rect method	Square method	Rect method	Square method	Rect method	Square method	Recy method	Square method
20,000	37	37	35	36	23	22	77	78
40,000	48	42	25	34	22	19	78	81
60,000	56	51	20	34	19	10	81	90
80,000	66	59	15	31	14	6	86	95
100,000	79	63	11	25	6	4	94	96
L.S.D.	5		8		8		6	

At higher population densities there was a more uniform light distribution with the square pattern attributable to the more even spacing of plants over ground area. The better arrangement of leaves to intercept light under square method was reflected in the fact while 80,000 plants per hectare were required to intercept 95% of the incident radiation under the square method, more than 100,000 plants were required to intercept the same under the rectangular method.

Dry matter produced from the square pattern was higher than from the rectangular patter except at the lowest population where there was essentially no difference. The difference in dry matter produced by plants from both configurations (square minus rectangular) is shown in Fig. 1.

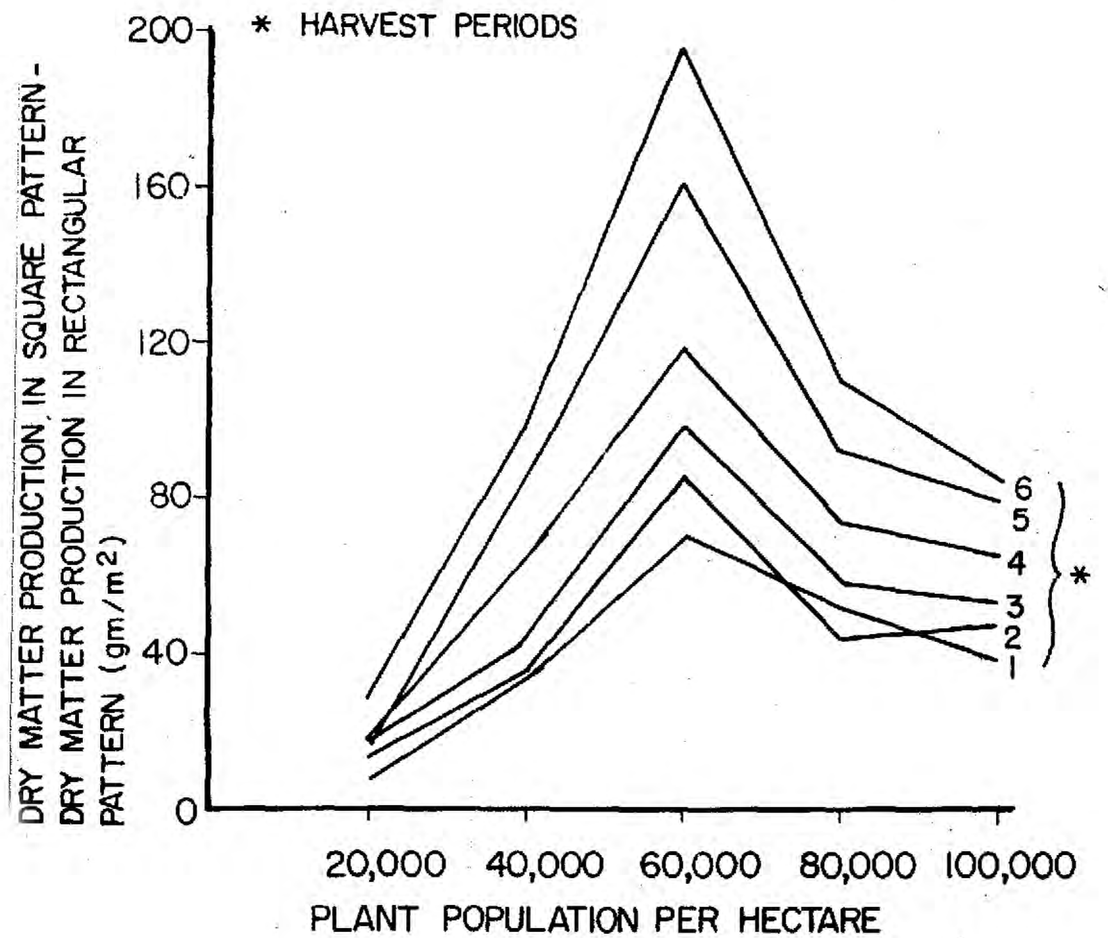

Fig. 1: Dry Matter Production in Square Pattern in Relation to Dry Matter Production in Rectangular Pattern as Function of Plant Population at Six Harvest Dates.

There was no significant effect of planting pattern on grain yield at the 20,000 and 100,000 plants per hectare (Table 3).

TABLE 3.
THE EFFECT OF PATTERN OF PLANTING ON MAIZE GRAIN YIELD, 1000 KERNEL WEIGHT AND NUMBER OF GRAINS PER/m^2.

Plant Pop.	Grain yield kg/ha		1000 Kernel Weight (gms)		No of grain/m^2	
Per hectare	Rectangular	square	Rectangular	square	Rectangular	square
20,000	3617	3575	310	313	1832	1872
40,000	4073	4341	305	312	2180	2469
60,000	5109	5600	292	306	2693	3047
80,000	3892	4190	273	287	2368	2670
100,000	2657	2714	258	261	2052	2086
L.S.D. 5%	253		28		220	

However, significantly higher yields were obtained with the square pattern at 40,000, 60,000 and 80,000 plants per hectare. Yield component analysis showed that the higher yield was due to higher grain number per m^2 as there was essentially no difference in grain weight.

From data presented it is evident that square pattern of planting is a more satisfactory system of reducing competition for light and increasing light penetration into the canopy with consequently higher yield.