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BRIEF COMMUNICATION

A Modification of the Method of the Regular Stand Density Increment

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Abstract. The employment of the classic stand density experiments in studies of the horizontal organization of plant stands is very laborious and requires a large experimental field area. The procedure based on the regular thickening of plant stands is more convenient for plants grown in a lower density. A simplified modification of this method is described which keeps a constant square nutritional area regardless of the plant densities.

Studies of the optimum density of plants with respect to species, cultivar, hybrid and individual agroecological factors require a knowledge of the biological curve of the tested character in stands of increasing density. Such studies are very laborious and require large experimental plots when the classical stand density experiments are employed. The procedure based on the regular stand density increment (Bleasdale 1967, Nelder 1962) is convenient for plants grown in lower densities. A complicated and time-consuming calculation of the basic experimental components represents the disadvantage of this procedure. The procedure described in the present paper is a modified method of regular stand density increment in which the calculation of the basic components is simplified. Care was taken to determine a square nutritional area for each plant regardless of various tested plant densities.

The basic principle of this method (Fig. 1), is the division of the classic experimental square into four isosceles triangles which may represent repetitions. The length of lines P_n marked out in each triangle and the distances among the individual lines gives a characteristic spacing which represents one thickening.

For calculation it is necessary to choose a number of plants in line K and the side of the nutritional area for one plant a_0 in the first margin line P_0. The side of the experimental square is determined by these values. The sides of nutritional areas for individual plants in the other lines are calculated subsequently from a_1 to a_n according to the formula

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$$a_n = a_{n-1} - \frac{2a_{n-1}}{K}$$

It is also necessary to know the distances of lines N_n from the centre of the experimental square S marked out on diagonal sections of the experimental square T. The diagonal-sections are determined by the centre and corners of the experimental square *i.e.*

$$T = \frac{K.\,a_0\sqrt{2}}{2}$$

N_n is calculated according to the formula:

$$N_0 = T - \frac{a_0\sqrt{2}}{2}$$

$$N_n = T - (a_0\sqrt{2} + \ldots + a_{n-1}\sqrt{2} + \frac{a_n\sqrt{2}}{2})$$

An example is given in Table 1 which contains the basic components of an experimental square $K = 20$, $a_0 = 60$ cm used in the experiment with maize (*Zea mays* L.) (Fig. 2, see the end of this issue).

TABLE 1
THE VALUES of BASIC COMPONENTS for $K = 20$, $a_0 = 60$ cm.

a_n	N_n	a_n	number of plants per ha
60.000 0	806.101 7	0.360 0	27 777
54.000 0	725.491 5	0.291 6	34 294
48.600 0	652.942 4	0.236 2	42 337
43.740 0	587.648 1	0.191 3	52 274
39.366 0	528.883 3	0.155 0	64 516
35.429 4	475.995 0	0.125 5	79 681
31.886 5	428.395 6	0.101 7	98 328
28.697 8	385.555 6	0.082 36	121 418
25.828 0	347.000 5	0.066 71	149 903
23.245 2	312.300 5	0.054 03	185 082
20.920 7	281.070 4	0.043 76	228 519

a_n = side of the nutritional square of one plant [cm]
N_n = distance of lines on diagonals in the experimental square [cm] measured from S
a_n^2 = nutritional square area of one plant [m²]

The described method requires a very simple calculation. It satisfies the experimental demands on the constant shape of nutritional area independently of the plant density and may be easily employed in practice. This method, however, does not amplify the posibilities of the analysis of plant growth in dependence on the effect of individual microclimatic and soil factors separately in each experimental variant. The mutual infiltration of the effects of these factors in space is not eliminated.

References

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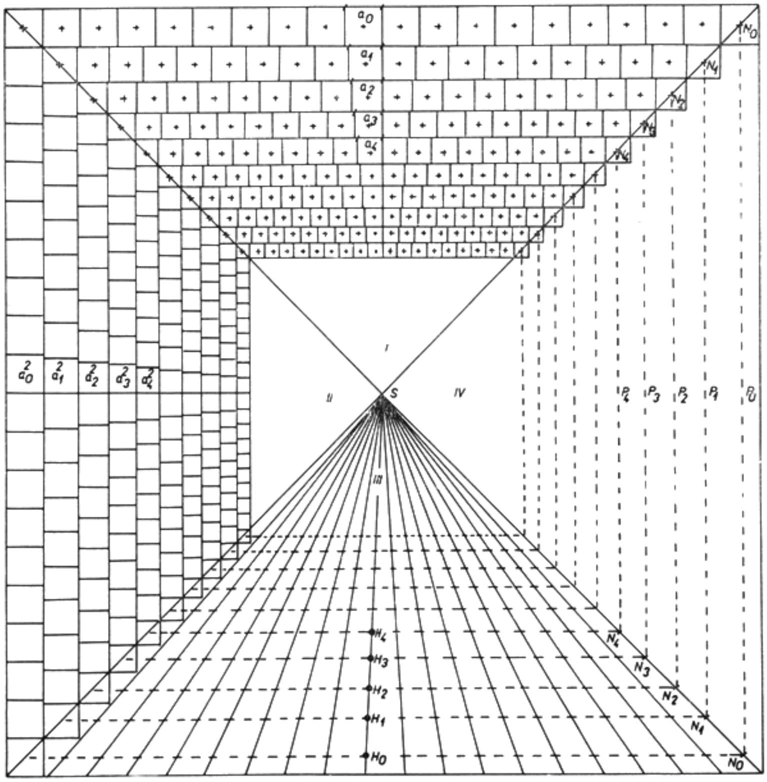

Fig. 1. Scheme of the modified system of regular stand density increment.

I, II, III, IV = repetitions
a_n = side of the nutritional square area of one plant
a_n^2 = nutritional square area of one plant
N_n = distance of lines on the diagonals from S
S = centre of the experimental square
$+$ = hills H_n
$-$ = lines P_n

Fig.2. Stand of the *Zea mays* L. in the phase of the formation of the third developed leaf examined by the method of regular stand density increment.