AUTOMATIC MAPPING OF THE SPREAD OF AFRICAN CASSAVA MOSAIC VIRUS

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The automatic mapping technique of cartography employed here uses the application of the theory of regionalized variables (2). Some examples of regionalized variables are: densities of human population in a given geographic zone, a mineral concentration in an ore-bearing earth ... The cumulative percentage of cassava contaminated plants is an adequately defined regionalized variable of density.

Let us consider the two following A and B linear sequences of numbers:

A: 1 - 2 - 3 - 4 - 5 - 6 - 5 - 4 - 3 - 2 - 1
B: 1 - 4 - 3 - 6 - 1 - 5 - 4 - 2 - 3 - 5 - 2

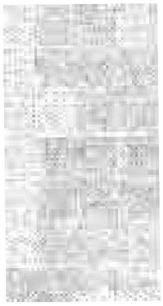
In case A we can see an obvious symmetrical structure; in case B the structure, if there is one, is unaccented; however, these two sequences of 11 numbers have the same variance. So these two mathematical values are insufficient to describe the structure and the main characteristics of a natural phenomenon.

The two main characteristics of a regionalized variable are the continuity and the isotropy in the considered space. If the continuity, in general, is unrespected we are in the case of an irregular repartition named "pure nugget effect;" the clearest example being the gold nugget field.

For a local estimation, the structural information needed is totally summarized by the semi-variogram study. Each point of this semi-variogram (G) represents for a given h distance (H), the mean (E) of the squared value of the deviation between the values of the regionalized variable in every point of the space studied $[Z(X+h);Z(X)]$.

$$G(H) = 1/2\ E[Z(X+h) - Z(X)]^2$$

Practically, this semi-variogram is adjusted to a modelized variogram. The different types of adjustment of the regionalized variables are likely to enable the deduction of spreading patterns of, for instance, the mineral element or the species, or the disease considered. In the case of ACMV, the experimental semi-variogram is likely to be adjusted to a straight line, showing a precise gradient effect in the structure of the variable within the considered trials. Furthermore, in the case of oriented variables, it is possible to calculate the semi-variogram in each direction and to find a prevalent direction. In these circumstances, the contamination is essentially a primary contamination (coming from outside the field) ("Spatial pattern of ACMV spread," same issue), following the direction of the prevailing wind and with a border



The figure above visualizes the results obtained with the automatic mapping with a cassava field of 1 ha, 6 months after planting, with a sampling of 7%. . The correlation between the observed and the calculated cartography is 0.81. Nevertheless, the knowledge of a border effect, particular to the spread of the ACMV disease, implies that a structured sample collection rather than a random sample collection should be chosen.

The kringing method enables the reduction of about 14 times the field observation work, while correctly giving the necessary structural information needed to study the spread of the ACMV viral disease in the experimental trials.

REFERENCES

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