Variability and Correlation of Corn Growth Parameters
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Introduction
Crop response to variability within a field can be measured in different ways to obtain reliable data which can help to make good management decisions. Crop spatial variability in the field also implies variability within a crop season, where during a stage of the growing period plants in specific areas of the field present good response but in other stages their response can indicate they are growing under stress and vice versa. Some growth parameters change independently from others and subsequently the correlation among parameters also fluctuates from one stage to another.

Experimental Field and Method.
Corn (Gold Dent KD772D, Kaneko Seeds) was planted in a 1.5 ha field on July 3rd, 2001. The field is divided in plots according to tillage or no tillage management as well as by chemical, manure or chemical-manure fertilizer treatments. Our experiment is located in the northern part of the field with an area of 0.3 ha, which corresponds to tillage management that is further divided into 8 plots from which 4 of them are manure treatments, 3 are NPK chemical fertilizer and 1 is a chemical-manure treatment.

One week after the corn was planted data of SPAD, plant length and number of green leaves were taken every week until harvest (for a total of 14 weeks). In order to take the data in the same position every week we located 5 measurement points in each plot (Figure 1) and selected and marked 6 representative plants per point. For SPAD data, in each measurement point we took 10 reading/plant, for a total of 60 reading/point, averaging the values after removing the minimum and maximum.

Results and Discussion.
During the observation time, spatial variability of the parameters measured was present all along the field as can be observed in Figure 2. To demonstrate the temporal variability of corn in this field, figure 2 also shows maps of 2nd and 7th week for both SPAD and length of plant and 2nd and 14th week for no. of green leaves/plant. In these maps we can notice that in some parts of the field high or low values were constant while in other areas higher temporal variability was present. In order to observe the variability in the different zones of this field during the growing season, the coefficient of variation (CV %) was calculated from normalized values. As for SPAD the center of the field presented the higher stability (lower CV) while the plants in Western and Eastern zones presented higher variability during the season. Among the parameters, the highest CV (9%) was observed in no. of green leaves/plant and most of the field presented high CV values. The
variation in length of plant along the field is more scattered than in no. of green leaves and SPAD maps.

As can be observed in figure 2, the pattern of the 3 parameters measured is similar for the 2nd week, but in the maps of other weeks' data different pattern is shown. This in-season variability affected the correlation among the parameters (Figure 3). During 2nd week a correlation value higher than 0.6 was obtained in the relationship among SPAD, length and no. of leaves, while in 7th week the correlation dropped close to 0.4 and going still lower during the 14th week for SPAD and no. of green leaves/plant.

Figure 3. Correlation between the measured parameters during the observation period.

Conclusions
The variability of corn response within the field was observed and analyzed. During one season the parameters used to measure plant growth can vary in lower or higher percentage from one area to another. The correlation among crop growth parameters fluctuates in time.