CORN yields on upland soils in the Blackland Prairie of Texas seldom exceed 60 bushels of grain per acre. Lack of moisture during the growing season is usually considered to be the limiting factor. Experiments conducted at the Temple Experiment Station, in which abundant moisture was applied by irrigation, have produced corn yields of about 90 bushels per acre. In such experiments fertilizer applications, plant populations, and cropping systems have been varied in an effort to eliminate these as limiting factors. These results indicate that climatic factors such as temperature, humidity, frequency of rains, number of cloudy days, and number of hot winds are limiting corn yields in addition to total amount of seasonal rainfall. To gain more knowledge of the factors involved, a study was made of relationships between several climatic factors and corn yields.

REVIEW OF LITERATURE

Several reports have been published concerning effects of climatic factors on corn. In most cases rainfall and temperature effects on inbred lines of corn were studied. Jenkins (3), Lonnquist and Jugenheimer (5), and Heyne and Brunson (2) reported effects of high temperatures and drought on growth and seed-set of inbred lines. Tatum and Kehr (7) found a very close relationship between seed-set and temperatures and humidities at pollination time. They suggested that temperature and humidity influence pollination indirectly through their effects on evaporation and transpiration. Basile (1) reports that drought periods in the northwest corner of the corn belt definitely reduce yields for years of drought, and in some cases even for the following year.

Time of year where shortage of moisture appears to do greatest damage is during the pollination period. Robins and Domingo (6) found that if plants were allowed to wilt for 1 day during this period, corn yields were reduced as much as 22%, if wilting continued for 6 to 8 days, yield reductions of as much as 50% resulted. Yield reductions were related to the time at which wilting occurred.

Kieselsbach (4) found highly significant corn yields in Nebraska and the following factors during June, July, and August; annual precipitation during June, July, and August; seasonal evaporation; seasonal relative humidity; as well as several other variables. In this study, temperature, and humidity gave the highest correlations with yields.

MATERIALS AND METHODS

Data on climatic conditions and corn yields were taken from records of Texas Substation No. 5 at Temple. Records were available for the 41-year period from 1913 through 1953, with a few exceptions where data for the first 2 or 3 years were not available. Climatic factors studied were rainfall during several periods of each year, mean maximum June temperature, number of rains in June, mean relative humidity in June, evaporation in June, number of cloudy days in June, and number of hot winds in June. Corn grown in this area is pollinated during June, and number of hot winds in June are important factors. Climatic variables for this month are of possible interest.

Yields used in this study were obtained from annual reports. A mean yield was secured for each year by averaging the ten highest yielding varieties or hybrids in the variety test each year. The top 10 varieties were used instead of all varieties because the number of entries varied during the 41-year period. Yielding varieties and hybrids were tested for 1 or 2 years while the lower yielding ones were discarded after 1 year of testing. Since the lower-yielding entries were discarded from the calculations, results of these correlations might be buffered against extremes, especially in years with extremely favorable climatic conditions. No doubt some variation existed from year to year due to previous crops, fertilizer treatments, and improved varieties and hybrids of corn. In most years, experiments were conducted with fertilizer treatments and cropping systems. In such cases three or four of the highest yields from these experiments were included in obtaining the yearly mean. The development of com hybrids might have resulted in higher yields during the last 15 years; however, according to the records, some of the highest yields were produced before hybrids were introduced. Perhaps decline in soil productivity has to some extent counteracted the effects of hybrids.