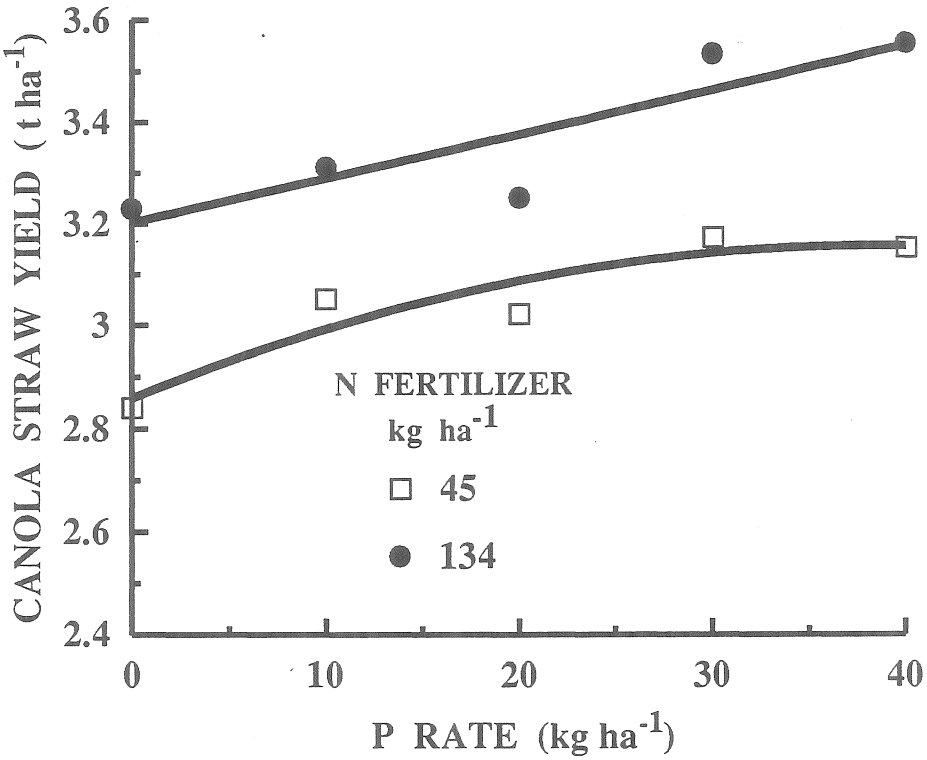
The effect of N, P, precipitation and temperature on yield of canola grown on Melfort silty clay soil.

by W.F. Nuttall and A.P. Moulin

This study was conducted over a period of 12 years to determine the effect of N and P fertilizers on yield of canola grown on Melfort silty clay soil previously cropped to wheat. The influence of soil tests for N and P and weather variables were to be evaluated to determine if these tests would be valid over the longer term. N fertilizer was applied at 45 and 90 kg N ha^{-1} in combination with 0, 10, 20, 30 and 40 kg P ha-1 to make up ten treatments. Rates of fertilizer above 10 kg ha-1 were side-banded. The yields of canola grain were increased from 1.18 t ha^{-1} (45N-0P) to 1.58 t ha^{-1} (134N-30P) on the average over the 12 year period (Fig. 1). Because of volunteer wheat in the sample (1980) and drought (1988), only 10 years data was included in the analyses. The drought year of 1988 was included in the rainfall and temperature regressions with grain and straw yield. Canola straw yields, also, were increased with the application of N and P fertilizer, from 2.85 t ha^{-1} (45N-0P) to 3.53 t ha^{-1} (134N-30P). Both N and P effects were highly significant in affecting grain and straw yields over years. The yearly fluctuation in yield and response to fertilizer of the canola grain and straw are shown in Fig 2. In some years, the control (45N-0P, kg ha^{-1}) was similar to the average mean yield. In some years the mean yield was higher than the 134N-30P treatment, indicating that lower rates of fertilizer would give the optimum yield.

The soil test for nitrate-N was significantly related to the response of canola to 134N-30P (kg ha^{-1})as shown in Fig. 3. Because of the large fluctuation in yield because of temperature and precipitation differences among years (Fig. 4), the prediction of yield response to N fertilizer is not precise in any one year. Over several years, average yield response to N and P can be measured with reasonable precision. The response to nitrogen may be affected by the response of the crop to P. The response to P, of course, is affected by the soil test for P (data not shown). The response of crops to P is complicated because the availability of P to plant roots in the soil may be increased with increased soil moisture. These several factors need to be taken into account in doing soil test correlations and in making fertilizer recommendations based on soil tests.



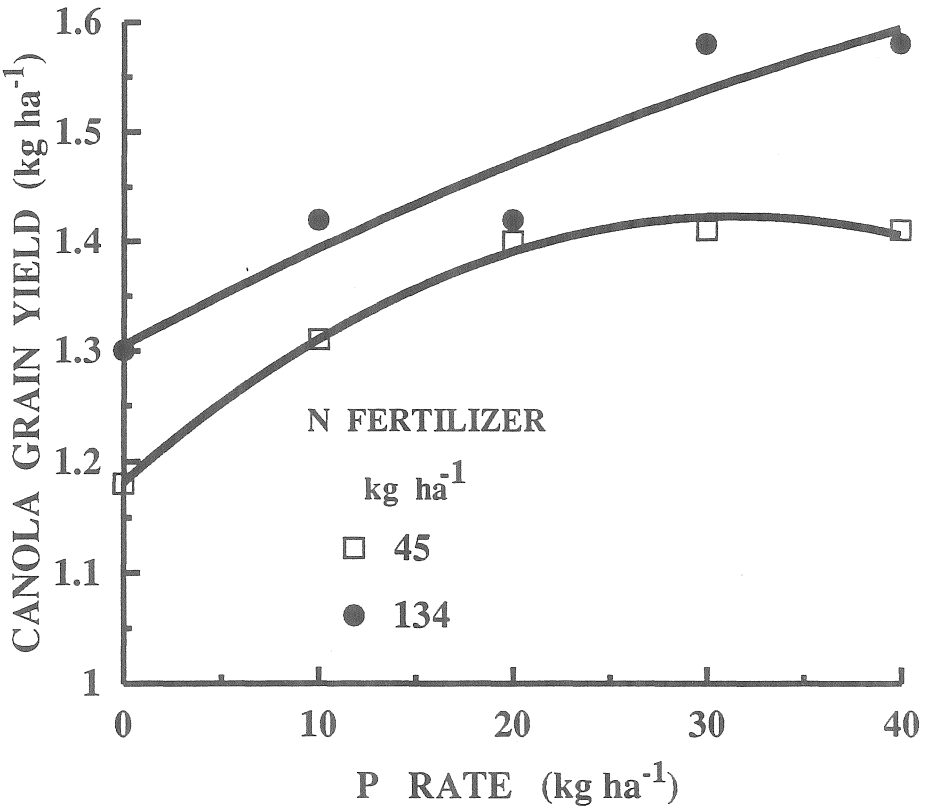


Fig. 1. The effect of P fertilizer on the yield of Canola grain and straw

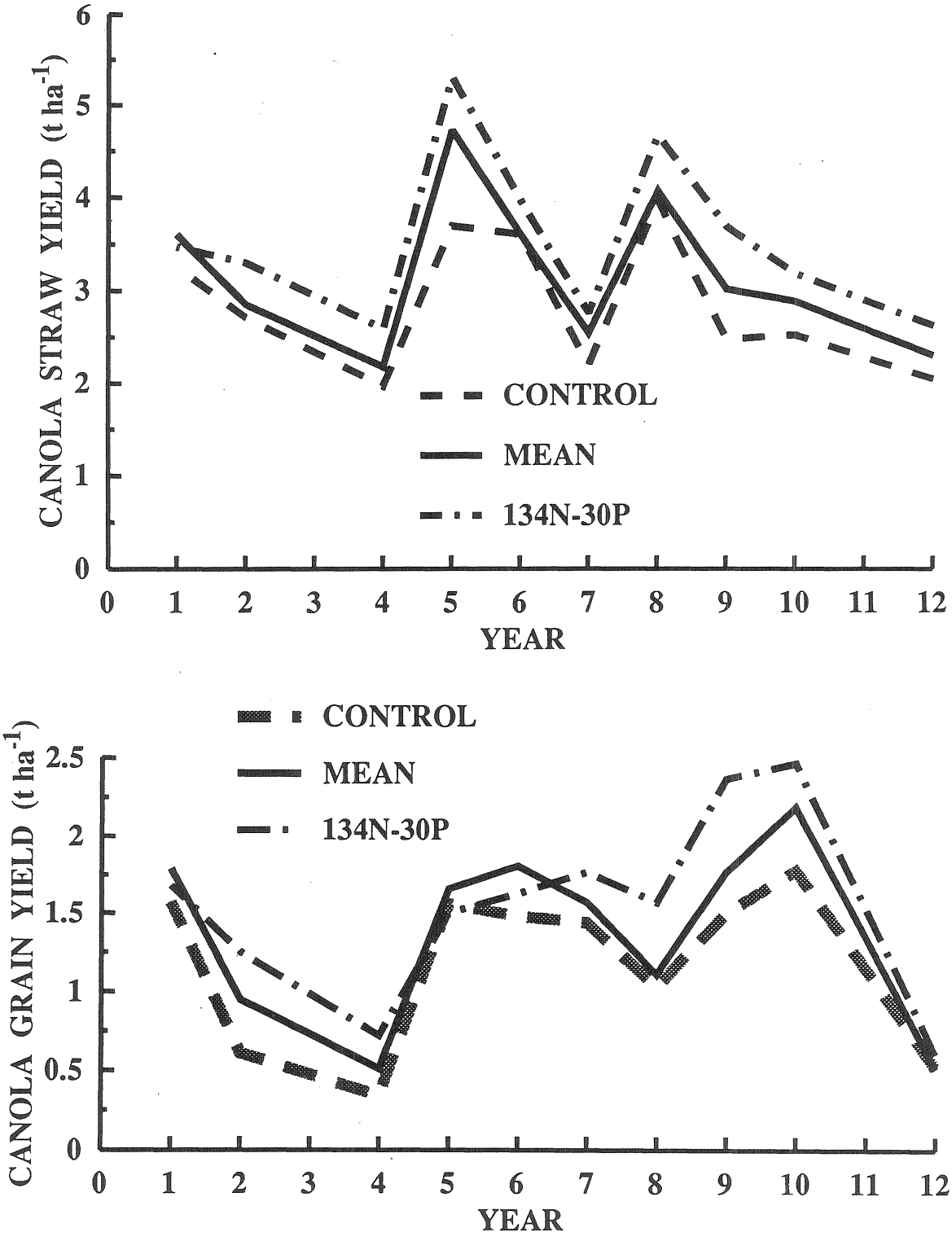


Fig. 2. Canola grain and straw yields over years 1978 -1989 for selected treatments.

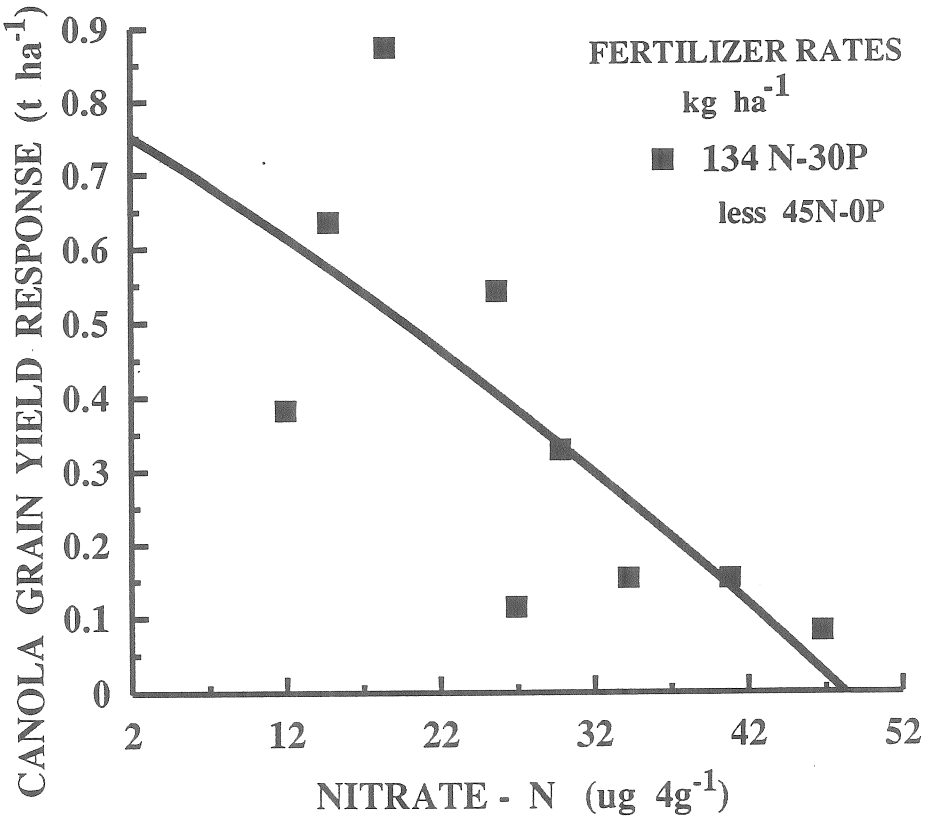


Fig. 3. Canola grain response related to available N in soil.

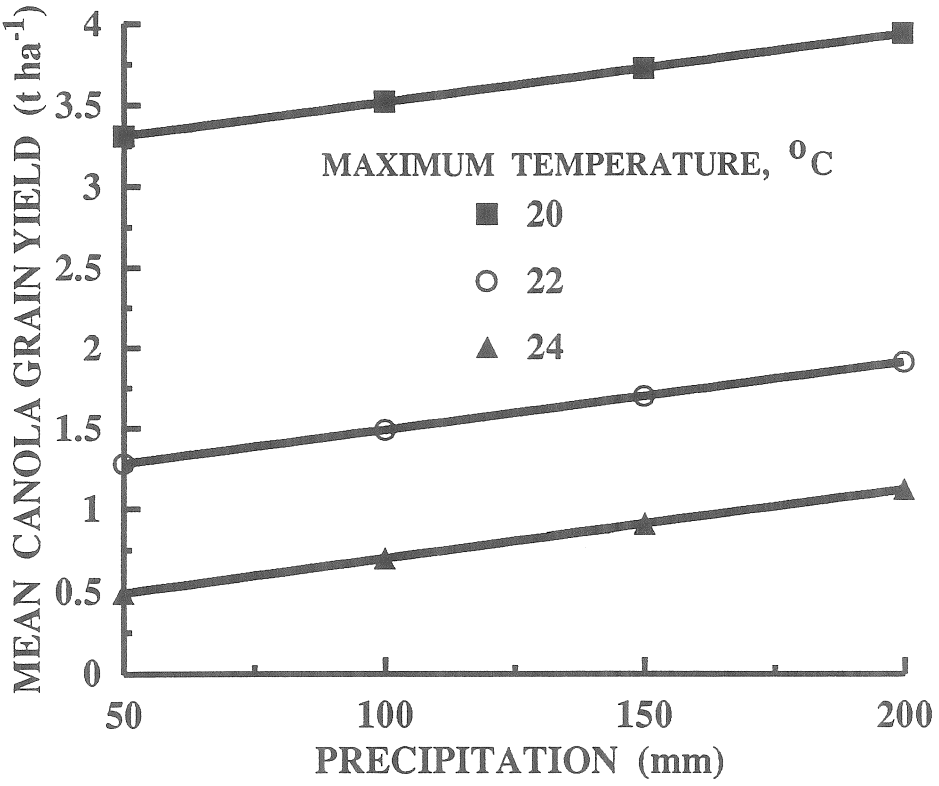


Fig. 4. Mean canola grain yield related to July, August precipitation and July, August mean maximum temperature, 1978 - 1989.