SEASONAL VARIATION OF WIND ERODIBILITY OF SASKATCHEWAN SOILS

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INTRODUCTION

Estimation about the wind erodibility of soils have relied on dry aggregate analysis. The work of Chepil (1942, 1950) established a strong correlation between actual soil movement under wind tunnel conditions and erodible size fractions determined by dry sieving methods. It has been established that 0.84 mm is the threshold size below which aggregates will erode under winds of normally occurring velocity. Anderson and Wenhardt (1966) report that soils containing greater than 60% erodible aggregates will erode with a wind of approximately 28 km/hr.

Soils have been grouped into wind erodibility groups (WEG) based on texture and presence of carbonates (Chepil et al. 1963). They are based on estimates of the average percentage of nonerodible fraction (> 0.84 mm) present before spring seeding. The percentage of the nonerodible fraction can vary from month to month. Work by Anderson and Wenhardt (1965) showed that the erodible fraction decreased from fall to spring and then increased again after tillage and seeding. Chepil (1954) reported that the erodible fraction increased from fall to spring with the largest increase occurring in fine-textured soils. Work on Saskatchewan soils by Hilliard and Rostad (1990) indicated that the erodible fraction increased over winter in clay and clay loam soils but decreased in sandy loam soils.

MATERIALS AND METHODS

The study was conducted from July, 1989 to June, 1990 on 25 sites in the Rosetown area. The soils ranged in texture from loamy sand (8.3% clay) to heavy clay (61.2% clay). At each sampling date, approximately 1.5 kg of soil were scraped from the soil surface to a depth of 3 cm. The sampling dates are given in Table 1. Each sample was air-dried and then sieved into five size fractions using a nest of flat-bottomed sieves and an electric shaking device. The size fractions were >4.75 mm, 2.0 - 4.75 mm, 1.0 - 2.0 mm, 0.85 mm - 1.0 mm, and < 0.85 mm.

Table 1. The sampling date for each plot.

July	July 21, 1989
May 1	May 10, 1990
May 2	May 17, 1990
May 3	May 24, 1990
May 4	May 31, 1990
Jun 1	June 8, 1990
Jun 2	June 15, 1990

RESULTS AND DISCUSSION

The soils were grouped into four textural groups and the data reported are means for each group. There were 3 sites in the clay group, 5 in the loam, 11 in the sandy loam, and 2 in the loamy sand. Figure 1 shows the seasonal change for each of the textural classes. The clay sites had less than 60% of the erodible fraction in July, 1989 but this increased to 77% in early spring. The erodible fraction then dropped to approximately 40% immediately after seeding and tillage. The loam sites had 70% erodible aggregates in July and this decreased to 55% by spring and increased slightly after seeding. None of the differences in the loam sites were significant. The sandy

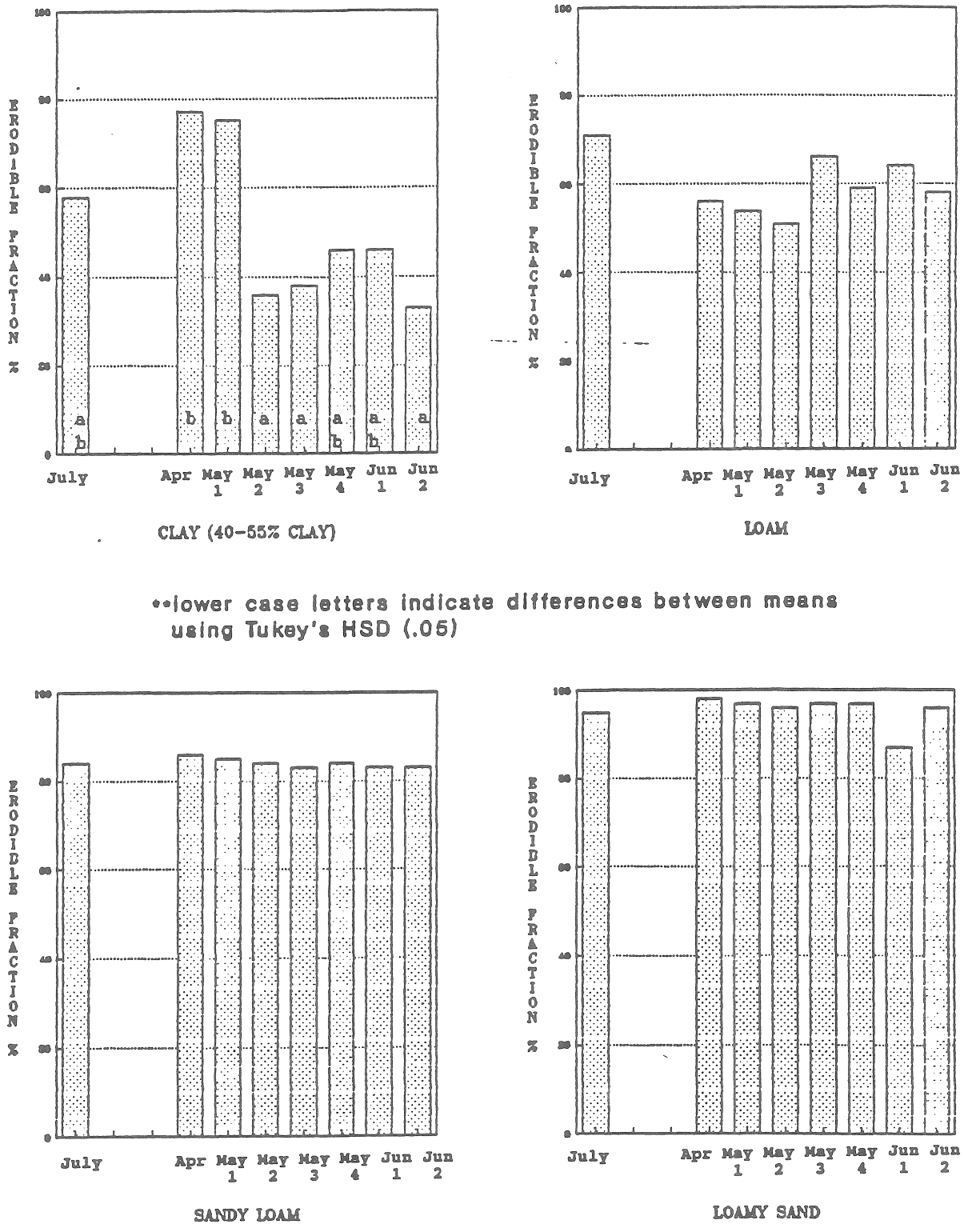

Fig. 1. Seasonal change of the erodible fraction for four textural groups

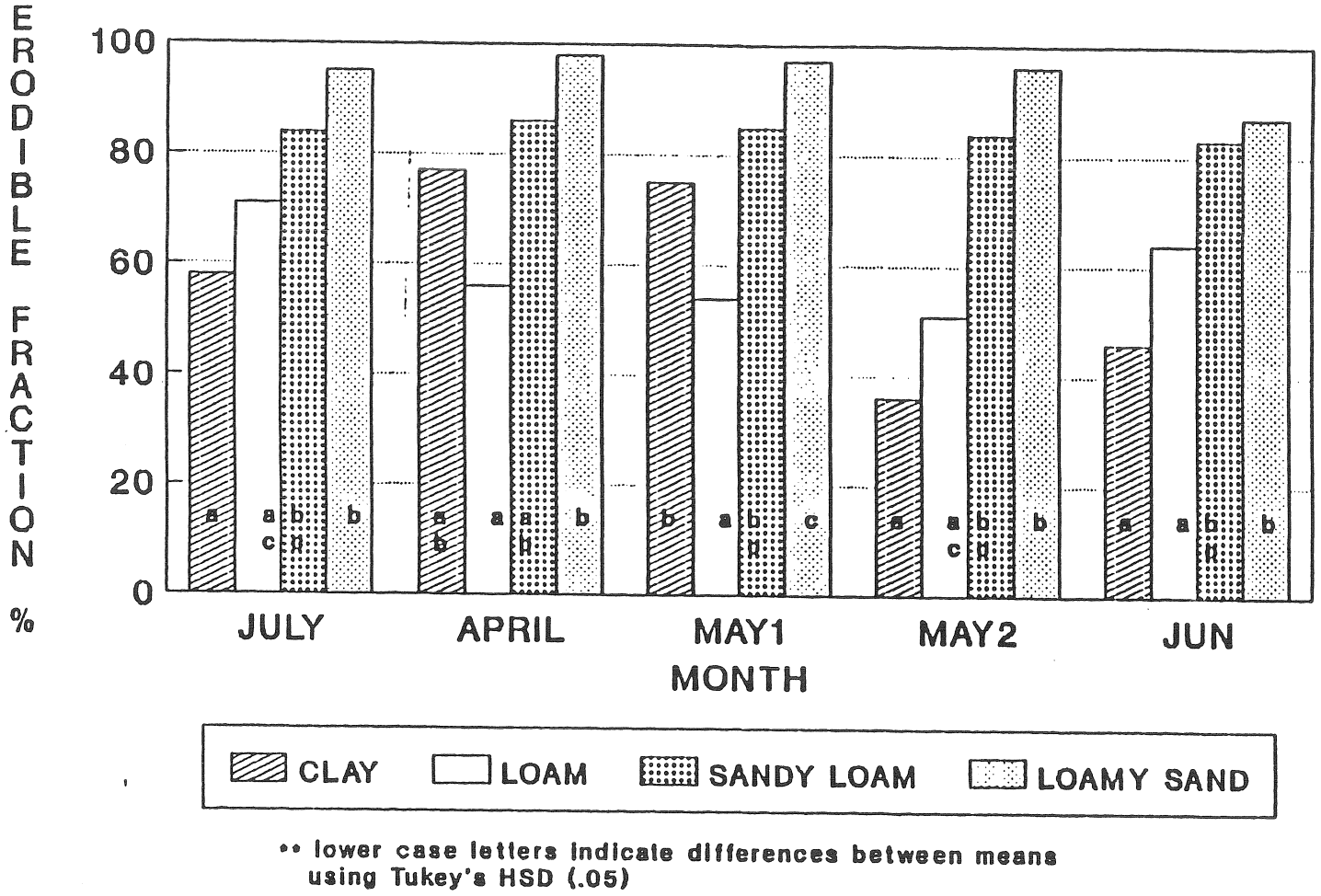

Fig. 2. Comparison of erodible fraction for four textural groups

loams were constant at approximately 85% erodible fraction with the loamy sands greater than 90%. There was visual evidence of early spring wind erosion on one of the clay sites and some of the sandy loams.

Figure 2 compares the amount of erodible aggregates present in the four textural groups at selected sampling dates.

The same lower case letter in each bar indicates no significant difference between means for each sampling date. During July and June, the clay and loam sites have similar amounts of erodible fraction. During April and early May, the clay and sandy loam sites have similar erodible fractions. This seasonal variability in the amount of the erodible fraction in clays and loams points out the difficulty in predicting annual rates of wind erosion. The wind erosion groups (WEG) set up by Chepil et al. (1963) are similar to the relative erodible fraction values measured in this study during April and early May. The WEG values are 75, 55, 75, and 90 percent erodible fraction for the clay, loam, sandy loam, and loamy sand textural groups, respectively.

Alternate freezing and thawing throughout the winter and early spring appear to cause breakdown of larger aggregates in the clay soils. Spring tillage, however, appears to increase the amount of larger aggregates and they remain stable throughout the summer. Aggregation appears to improve over winter for the loam soils and then decrease during the summer with subsequent tillage. Sandy soils remain in an erodible condition all year round.

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