SMITH, LARRY J. Northwest Experiment Station, University of Minnesota, Crookston, MN 56716. - The effect of defoliator flail type, number, configuration, speed of operation, and crown removal under pre- and post-frost conditions on sugarbeet yield and quality.

ABSTRACT

With the advent of payments to sugarbeet producers based on extractable sucrose/T, rather than on tonnage or extractable sucrose/A, the setup and operation of defoliators to remove leaf, petiole and crown material could have dramatic effects on overall profitability. Field scale and small plot trials were established to determine the effect of flail type, number, configuration, speed of operation and crown removal, on yield and quality under pre- and post-frost conditions using triple drum defoliators. Of three flail types and seven configurations tested under pre-frost conditions, three drums of rubber flails, steel or studded flails on the front drum, followed by two drums of rubber flails, removed the most petiole material from the crown and significantly increased extractable sucrose/T. Increases ranged from 8-13 lb/T. Post-frost (<17°F), all configurations and flail types were inferior to studded or steel flails on the front drum followed by rubber flails on the rear two drums. Increasing the speed of defoliator operation, 2 through 6 mph, decreased extractable sucrose/T, due to excessive petiole material remaining on the crown. For each mph increase, an average of 0.23% sucrose and 6.0 lb of extractable sucrose/T was lost. The negative affect of increased speed was not overcome by flail type or configuration, pre- or post-frost. Scalping, to remove a small portion (1-1.5 inch) of crown material or petiole material remaining from flailing, increased extractable sucrose/T. Scalping, however, could not overcome the negative effects of improper flail configuration, type or speed, pre- or post-frost on extractable sucrose/T. Losses in yield from scalping at a defoliation speed of 3 mph ranged from 1.35 - 2.36 T/A depending on the height of the crown above the soil surface. These yield losses negated improvements in the quality parameters and resulted in equal return/A. Speeds of 4 mph or greater increased field loss with scalping due to increased root breakage and knockout. Yield losses were the highest with high crown varieties. Increasing the number of pins of rubber flails on the middle and rear drums (4 and 6 respectively, are standard) to combinations of 6 or 8, increased the amount of petiole material removed from the crown and increased extractable sucrose/T. Configurations with 8 pins of flails on the rear drum, while significantly increasing extractable sucrose/T, caused severe crown damage and loss in yield due to breakage and knockout. Adding pins of flails could not overcome the negative effect of speed. In summary, under pre-frost conditions, a flail type and configuration of all rubber or a front drum of studded or steel flails followed by two drums of rubber flails is recommended. Post-frost, a front drum of steel or studded flails followed by two drums of rubber is recommended (cooperative or company policy may determine use of certain flail types). Adding pins of flails over standard configurations decreased yield and increased crown damage, which can increase sucrose loss in storage. Excessive speed will reduce quality, yield, increase processing and storage losses and reduce income. Maximum speed recommended is no more than 3 mph. Scalping is a personal, cooperative or company decision. Scalping will not overcome the effects of excessive speed or improper flail type or configuration.