

Watch Particle Size and NDF Levels in High Corn Silage Diets

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In Midwest dairy rations, corn silage is often 65% or more of the total forage dry matter (DM). As corn silage replaces hay and haylage in diets, adequate particle size and the amount of neutral detergent fiber (NDF) in the diet for good rumen health and milk fat percentage become increasingly important. This article reviews several Journal of Dairy Science studies that have looked at the effect of corn silage particle size and total NDF content of high-corn silage diets on DM intake, milk production and milk fat percentage of lactating dairy cows.

Particle Size. A common method for evaluating particle size is through the use of the Penn State particle separator box. The top screen retains particles greater than 3/4" which is considered the physically effective fiber particles that stimulate cud chewing and good rumination. The standard recommendation for corn silage particle length is 3-8% on the top screen. When corn silage is the only forage in the ration, the top screen should retain more than 8% for adequate particle length in the ration.

In a number of research studies where corn silage was greater than 35% of the total ration DM, corn silage particle size had no effect on milk production or DM intake (Figure 1). However, as the percentage of corn silage particles above 3/4" increased, sorting of corn silage from the total mixed ration (TMR) became a problem in a few studies.

In studies where cows produced 80 lb milk/day or greater, milk production tended to decline as the percentage of corn silage particles in the pan (particles <1/3") increased (Figure 2). This is most likely a result of fine-chopped corn silage not supporting good rumen health and cud chewing.

Diet NDF. The effect of diet NDF on DM intake and milk production is shown in Figure 3. Milk production and DM intake are not affected by NDF content of the diet when it is in the normal recommended range of 28-33%. In an unpublished study (Linn), diets ranging 26-38% total NDF and containing 40-45% corn silage did not affect milk production (average 97 lb/day), but DM intake declined linearly from 63 to 54 lb/day as total diet NDF increased from 26 to 38%. Based on these studies, a minimum of 30% NDF in the total diet should be fed when corn silage is 65% or more of the forage DM in the diet. High-fiber byproduct ingredients with digestible NDF appear to be good ingredients to match with high corn silage diets.

Conclusion. When feeding diets with over 65% of the forage DM coming from corn silage, make sure there is adequate, but not excessive particle length. The target is 7-10% of feed on the top screen and 60% or more of the feed on the top 2 screens. Achieving this particle length target along with 30% or more NDF in the diet will maximize DM intake, maximize milk production and support good cud chewing.

Data from Journal of Dairy Science (authors/year): Bal et al., 2000; Clark et al., 2002; Dhiman et al., 2000; Johnson et al., 2003b; Kononoff and Heinrichs, 2003; Kononoff et al., 2003; Neylon and Kung, 2003; Onetti et al., 2003; Schwab et al., 2002; and Weiss and Wyatt, 2000.

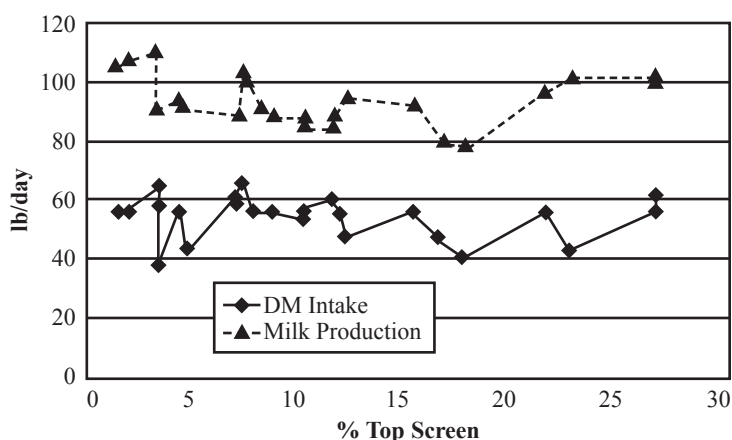


Figure 1. Relationship of corn silage particles > 3/4" to DM intake and milk production.

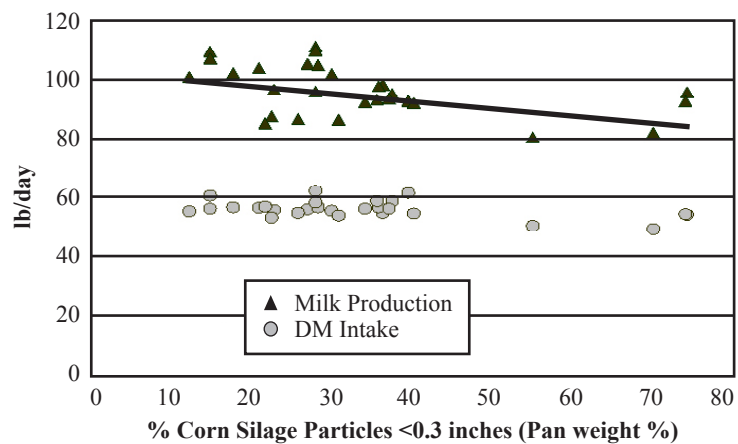


Figure 2. Relationship of corn silage particles < 1/3" to milk production and DM intake.

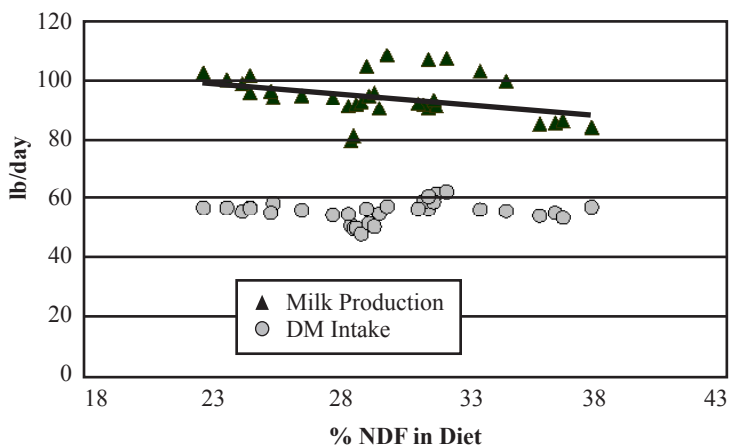


Figure 3. Effect of total diet NDF on production parameters when fed in diets containing 35% or more of the DM as corn silage.