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A METHOD FOR SALVAGING BIRD DAMAGED PEARL MILLET RESEARCH

J.A. Pudelko, D.L. Wright, I.D. Teare*

ABSTRACT

Pearl Millet [Pennisetum glaucum (L.)] is a potentially-productive, high-quality grain crop that is highly susceptible to bird damage in small plots and in areas around the outside of large fields. Even when research plots are in the center of a large field of pearl millet, treatments that change the physiological maturity (specifically the soft dough stage which red winged blackbirds seem to prefer and seek out) of certain plots will result in their destruction. Our objective was to relate pearl millet grain yields with head length and seed size measurements of undamaged panicles selected for specific head lengths (15, 12, and 9 inches) with linear regression for predicting grain head yields per unit area and estimation of grain yield per acre of bird damaged pearl millet research plots. This research was conducted on a Norfolk sandy loam located on the North Florida Res. and Educ. Ctr., Quincy FL with HGM-100 (W.W. Hanna, Tifton, GA) pearl millet hybrid. Three hundred and sixty pearl millet (HGM-100) panicles that were not damaged by birds were selected at random for three different lengths of panicle (15, 12, and 9 inches in length) for

J.A. Pudelko; Agric. Univ. Inst.of Soil Cult. and Plant Prod.,Mazowiecka 45/46, 60-623 Poznan', Poland:
D.L. Wright, I.D. Teare; North Florida Res. and Educ. Ctr. Quincy, FL 32351 (Dept of Agronomy, Inst. of Food and Agric. Sci., Univ. of Florida, FL 32611) Florida Agric Exp. Stn. Res. Rep. No. NF 93-12.
*Corresponding author.

grain yield and linear regression analysis. A simple linear equation is presented for predicting grain head yields: Y = 6.98 + 191.22 X, where Y = pearl millet head yield and X = head length. Grain head yields can be predicted if all the head lengths are measured in a unit area and then converted to yield per acre with a $\underline{P} < 0.0001$.

INTRODUCTION

Pearl millet is a potentially-productive high-quality grain or silage crop (Burton et al.,1986 and Kumar et al., 1983). It is grown under low-input management conditions (noncrusting sandy soils with little fertilizer and limited water; Payne et al., 1990) and fits the summer growing season presently occupied by crops such as soybean, peanuts, sorghum, tropical corn, bahiagrass, and bermudagrass in a year-round multiple cropping system of the southeastern United States.

Two major problems have been demonstrated by Wright et al. (1993). First, HGM-100 is a small seeded crop with the need for uniform depth of planting which can be remedied by improved planter engineering and careful planter adjustment. Second, is the problem of the crops susceptibility to extensive bird damage to maturing panicles (the milk stage is the most susceptible stage) (Wright et al., 1993).

The objectives of this study was to find a parameter persistent after bird damage for accurately predicting pearl millet grain yields for salvaging small plot research that had been successfully conducted up to the milk stage and bird invasion.

MATERIALS AND METHODS

These studies were conducted in 1993 on a Norfolk sandy loam (fine, loamy siliceous, thermic Typic Kandiudult) located on the North Florida Research and Education Center, Quincy, Florida. The soil has a compacted layer located 8 to 14 inches below the surface.

The pearl millet hybrid used in this study was HGM-100, developed as a grain pearl millet by W.W. Hanna (1991), Tifton, Georgia. Pearl millet seed was no-till planted in a weed fallow field with a Brown Ro-Til implement with KMC planters in a completely randomized block design with six replications on 29 May 1993. Before the millet was planted, the weeds were burned down with applications of Round-up (7 May) at 2 pt/A and Gramoxone (21 May) at 3 pt/A. Seed of pearl millet were planted 3/4" deep at 4 lbs/A (322 000 seeds/A planted) with an emergence of approximately 177 000 plants/A (55% emergence). Plots were 24′ X 30′ with eight rows 36" apart.

Five hundred lb of 5-10-15 fertilizer/A was applied on 15 May before planting. Ammonium nitrate was sidedressed to the side of the row at 120 lb N/A on 16 July. Prowl @ 1 qt/A + Atrazine @ 2 qt/A was used for weed control (Wright et al., 1993). Herbicides were applied between stage 1 and 2, about 12 days after planting when millet was between 3 and 5 inches tall.

Pearl millet heads were measured from top to bottom of panicle as illustrated in Fig. 1. Twenty pearl millet heads were carefully selected for each of three specific head lengths (9, 12, and 15

inch) and replicated six times with concomitant measurements of head grain yields and counts of heads per unit area which were used for regression analysis. Pearl millet heads were harvested on 28 Sept, dried in a greenhouse, and threshed with a clover threshing machine that required 20 pearl millet heads per sample for the threshing operation.

Little rain occurred throughout the growing season for this rainfed experiment. A total of 19.0 inches of rainfall was recieved during the pearl millet growing season from 29 May to 28 Aug, 1993. Rainfall events and amounts are shown in Fig. 2.

RESULTS AND DISCUSSION

Wright et al. (1993) experienced extensive bird damage to pearl millet in some small plot research in 1992 and used a grain to silage-without grain ratio from an undamaged pearl millet herbicide study to estimate grain yield from other bird damaged research plots. This estimate was better than nothing, but a better predictor of bird damaged pearl millet yield was needed. In 1993, they tested the null hypothesis that pearl millet grain yield per head could be predicted from head length measurements.

Six replications of 20 non-bird damaged pearl millet grain heads of specific lengths (15, 12, or 9 inches) were carefully threshed and grain yield per head and grain weight per seed were found to be significantly different for each head length (Table 1).

A simple linear regression equation was developed to predict head yield from head length: $Y = 6.98 + 191.22\ X$, where Y = pearl

millet grain yield (lb/head) and X = head length (inches) with a correlation coefficient of correlation (r) = 0.96 and $\underline{P} < 0.0001$. A simple linear equation was also developed to predict head yield from grain size (seed/lb): $Y = -2.038 + 12.42\ X$, where Y = pearl millet grain yield (lb/head) and X = seed/lb with a correlation coefficient of correlation (r) = 0.90 and $\underline{P} < 0.0001$.

When grain size (seed/lb) and head length were used in a multiple regression analysis, the equation developed was: $Y = -0.034 + 0.004\ X_1 + 0.763\ X_2$, where Y = pearl millet grain yield, X1 = head length (inches) and X2 = grain seed size (seed/lb) with a coefficient of correlation (r) = 0.92 and $\underline{P} < 0.0001$.

We agree that the best measure of grain yield is from undamaged pearl millet heads per unit area, but using predictions of head grain yield from head length measurements of a specified unit area can salvage previously collected time consuming research that is irretrievably damaged in the soft dough stage by birds . The most useful equation for predicting head grain yield is the simple linear regression where head length explains 90 % of the variation in head grain yield.

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LEGEND

Figure 1. Length of pearl millet head measured as illustrated.

Figure 2. Rainfall during the 1993 pearl millet growing season in relation to rainfall amounts and dates of events.