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# Dealing with Plant Stress in Louisiana Sugarcane Production – A Continuation

In the last issue we discussed early-season grower management decisions relating to the removal of residue blankets generated during green cane harvesting, clipping of winter-killed growth, spring cultivation, and soil fertility that could negatively impact cane and sugar yields in Louisiana and thereby essentially represent grower-induced stresses. In this article we will continue to share with you additional research results on the influence of lay-by cultivation, planting practices, and ripener usage on cane and sugar yields. Our goal continues to be to communicate how we can minimize grower-induced stresses in our production practices to reduce adverse impacts, especially on ratoon crops.

After fertilization, the next production practice in Louisiana is some form of cultivation of the row sides just prior to canopy closure (lay-by cultivation). USDA-ARS research at the Sugarcane Research Laboratory in Houma indicates that some form of cultivation is necessary to optimize ratoons yields. Cane and sugar yields were increased by 7% when first-ratoon cane was cultivated verses no cultivation. There are several possible explanations for this yield increase, but we will only discuss one. Soil is often removed with the chopper harvester when cane is lodged or when harvesting in wet-weather conditions. This soil needs to be replaced for good ratooning because ratoon setts without adequate soil protection become more vulnerable to stresses such as cold temperatures, disease, desiccation, and water-logging. Timing of the lay-by cultivation is also important. If this last cultivation of the season is done several weeks before canopy closure, weed control can become a problem; if cane is cultivated too late you can get some root pruning

Planting decisions can also impact yield; hence represent another form of grower-induced stress. Our research with the varieties LCP 85-384, HoCP 96-540, Ho 95-988, and L 97-128 indicates that planting in August increases yields in the plant-cane crop by 6 and 18% compared to planting in September and October, respectively, with these yield increases often persisting into the first-ratoon crop. More seed-cane acreage is used for an August, planting because stalks are shorter, but the stalks are usually straighter which makes planting easier, and the yield increase more than compensates for the extra seed cost. Accounting for seed-acreage used, an August planting increases net revenue by 5 and 17% compared to September and October plantings, respectively.

Depth of cover at planting is another potential source of grower-induced stress. Research indicates that 5 – 8 cm of soil insures earlier and more uniform crop emergence and higher plant-cane yields. This amount of soil, though, may not provide adequate protection from cold temperatures which would represent an environmental stress on the crop. Growers can reduce the potential impact of a freeze on plant cane by employing a fall cultivation to add soil once stands are established and the initial herbicide protection appears to have diminished.

Planting rate used is another factor that can influence crop vigor and yield and hence could be considered as another form of grower-induced stress. If one uses a sub-optimal planting rate, especially with slow emerging varieties like HoCP 96-540, yields may become depressed due to poor stands and large gaps. Moreover, weak stands will allow the establishment of weeds with the perennial weeds bermudagrass (*Cynodon dactylon*) and johnsongrass (*Sorghum halepense*) being especially problematic. If too much seed-cane is used, all the seed may not contact soil and therefore may promote the buildup of stalk rotting organisms. This could influence the stand of plant cane the following spring and have implications in the subsequent ratoon crops as well. Using a high seed-cane rate is also an unnecessary expenditure. Louisiana conditions can only support about 40,000 stalks per acre, so establishing excessive shoots that will never be harvested is unnecessary.

Ripener usage can actually be a beneficial grower-induced stress if used correctly, but can cause excessive stress to the ratoon crop in the subsequent spring when used improperly. Often times when the rates of glyphosate used to chemically ripen the cane are too high or longer treatment to harvest intervals are imposed, the subsequent ratoon crop's spring emergence is delayed. As a result, weed competition may be greater and at the very least, the all ready short growing season is shortened even more. This delayed emergence often creates some grower anxiety as well – another form of stress. One must consider the proper rate and treatment-to-harvest interval to avoid hurting the subsequent ratoon. Our research on LCP 85-384 indicates that a treatment-to-harvest interval of 60 days will decrease yield the following year. In fact, harvesting ripener-treated cane at 60 days after application shows no yield advantage to sugarcane not treated with ripener because the loss of tonnage by ripener application negates increases in sugar content. Preliminary data on the newly released varieties (HoCP 96-540, Ho 95-988, and L 97-128) indicate that cane and sugar yields are not reduced in subsequent ratoons when the ripeners are used according to recommendations. Our research suggests that the magnitude of the stress from chemical ripening is also related to the crop's vigor, especially in varieties such as LCP 85-384 whose yield potential seems to be declining.

Cold temperatures can lead to lower yields and possible total loss in Louisiana. This is a stress that management practices can not, at this time, avoid, but one can minimize post-freeze losses by a well thought out harvest schedule. USDA-ARS scientists, in cooperation with LSU scientists, screen all current commercial varieties to determine post-freeze deterioration in an effort to help growers minimize risks by harvesting more susceptible varieties first. Moreover, USDA-ARS scientists are breeding with wild germplasm from cooler areas of the world in an effort to produce

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madurante anula cualquier aumento en el contenido de sacarosa. Datos preliminares obtenidos de variedades recientemente liberadas (HoCP 96-540, Ho 95-988 y L 97-128) indican que los rendimientos en caña y azúcar no son reducidos en los retoños subsiguientes cuando los madurantes son usados de acuerdo a las recomendaciones. Nuestra investigación sugiere que la magnitud del estrés producido por el madurante químico está también relacionada con el vigor del cultivo, especialmente en variedades tales como la LCP 85-384, cuyo potencial de rendimiento parece estar declinando.

En Louisiana, las temperaturas frías pueden conducir a menores rendimientos y posiblemente a pérdidas totales. Este es un estrés que en ese momento, las prácticas de manejo no pueden evitar, pero se pueden minimizar las pérdidas post-helada, mediante un programa de cosecha bien planificado. Científicos del USDA-ARS, en cooperación con científicos de la Universidad Estatal de Louisiana, evalúan todas las variedades actualmente a nivel comercial para determinar el deterioro post-helada, con el propósito de ayudar a que los productores reduzcan al mínimo los riesgos, cosechando primero las variedades más susceptibles. Es más, los científicos del USDA-ARS están haciendo cruzamientos con germoplasma silvestre procedente de otras áreas más frías del mundo, con miras a producir variedades comerciales de tallos y retoños con excelente tolerancia a las heladas y tal vez con suerte, también con tolerancia al frío de los brotes de primavera. Estamos también trabajando con percepción remota y modelos para calcular los rendimientos del cultivo en áreas extensas, tratando de optimizar las fechas de inicio de la molienda para así elevar al máximo el crecimiento del cultivo y reducir al mínimo los riesgos de final de temporada. Cada uno de los estreses que hemos discutido puede tener cierto impacto en el rendimiento y las ganancias del productor. Cuando se combinan, el impacto de dos o más de estos estreses puede tener un efecto significativo en la viabilidad económica del productor. Se necesitan buenas prácticas culturales para reducir los riesgos, optimizar los rendimientos y elevar al máximo las ganancias.

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commercial varieties with excellent stalk and ratoon freeze tolerance and hopefully spring shoot cold tolerance as well. We are also working on using remote sensing and models to estimate crop yields for large areas in an effort to optimize mill start dates to maximize crop growth but minimize late-season risks. Each of the grower-induced stresses discussed can have some impact on yield and grower profits. When combined, the impact of two or more of these stresses can have a major impact on a grower's economic viability. Good cultural practices are necessary to reduce risks, optimize yields, and maximize profits.

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