are found in the cytoplasm. These ribosome particles, visible only with the electron microscope, contain a large fraction of RNA.

Protein Synthesis Studied

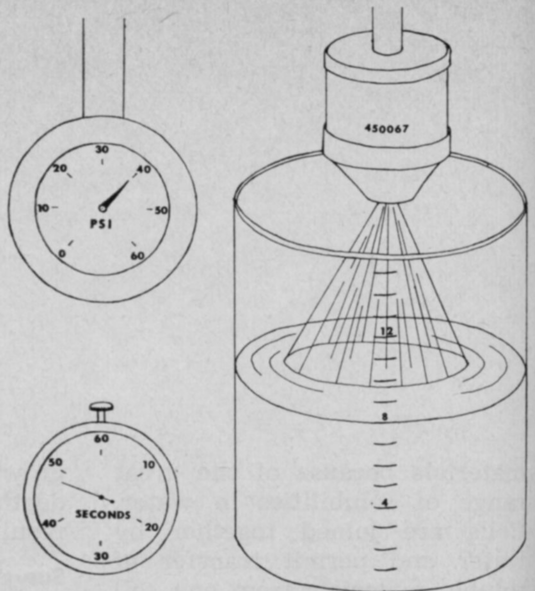
In our search for the key to what the stress of lack of water may be doing to limit growth, we looked first at protein synthesis. We found that when water stress reduced protein by 40%, growth was reduced twice that amount or 80%. Contrary to what may have been expected, total RNA increased by 30% in the same water-stress treatment. More surprising still, the increase in RNA appeared in the ribosome fraction. This meant more machinery was present for making protein, yet less was made.

Subsequent tests revealed that the information from the nucleus was being drastically altered by the water stress. We do not yet know whether messenger RNA is still being made as a result of the drought conditions, or whether the message that is synthesized does not contain the correct information. At any rate, we have determined that water stress prevents mRNA from functioning in protein synthesis. We are now trying to determine the nature of the effect of drought on this very important fraction of RNA. Then we will be searching for plant materials whose mRNAs are not susceptible to water stress, or for ways of inducing resistance in our fabricated, drought-tolerant grass.

References

1. Bernstein, L. The Needs and Uses of Water by Plants. USDA Yearbook of Agriculture, "Water" 18-25. 1955.
2. Kramer, P. J. Transpiration and the Water Economy of Plants. *Plant Physiology* edited by F. C. Steward Vol. II Academic Press N. Y. 607-726. 1959.
3. Meyers, B. S., Anderson, D. B., and Bohning, R. H. Introduction to Plant Physiology. D. Van Nostrand Co. Inc. N.J. 1960.
4. Parker, J. Drought Resistance in Woody Plants. Botan. Rev. 22: 241-289 (1956).
5. West, S. H., Protein, Nucleotide, and Ribonucleic Acid Metabolism in Corn During Germination Under Water Stress. Plant Physiology 37:565-571. 1962.

Are Worn Nozzles Stealing Your Spray Chemicals?



Worn and uncalibrated boom sprayer nozzles are important causes of wasted chemical on large-scale, blanket spray jobs. Holes in nozzles become larger from wear caused by impurities and abrasives in chemical sprays and water.

To determine the actual discharge of a spray nozzle, regulate the pump at 40 pounds per square inch (PSI), and catch the discharge of one nozzle in a measuring container for one minute. Use a container measured in ounces.

Check the number of the spray nozzle. Count three decimal places from the *left;* this will be the original discharge rate of the nozzle hole at 40 PSI. If, for example, the number is 8002, nozzle discharge should be 0.2 gallons per minute (GPM). If the number is 800067, the output from that nozzle should be .067 GPM.

Note the amount of liquid collected in the measuring container. When the nozzle output is supposed to be 0.2 GPM, 25.6 ounces should be collected. If .067 GPM is the nozzle-output rating, 8.5 ounces should be collected in one minute.

Ounces are converted to gallons by using the following formula:

$$\frac{128 \text{ oz.}}{1 \text{ gal.}} = \frac{\text{(Ounces collected in one min.)}}{\text{(Gallons discharged in one min., GPM)}}$$

If 8.5 oz. are collected, 8.5 replaces "(Ounces collected in one min.)" in the formula. To find "(Gallons discharged in one min., GPM)", cross-multiply.

$$\frac{128 \text{ oz.}}{1 \text{ gal.}} = \frac{8.5 \text{ oz.}}{\text{(Gallons discharged in one min., GPM)}}$$

$$1 \text{ gal.} \times 8.5 \text{ oz.} = 128 \text{ oz.} \times \text{(GPM)}$$

To find GPM, multiply 1 gal. by 8.5 oz. to get 8.5. Now divide by 128 and the answer is .067, showing that the nozzle is giving out the rated number of gallons it was originally calibrated to put out. However, if the nozzle number rating is less, .055 GPM for example, then the actual output (8.5 oz. or .067 GPM) is too much, and chemical spray will be wasted.

A nozzle that discharges .067 GPM when it is expected to discharge only .055 GPM wastes more than ½ gallon of spray solution in one 8-hour day. Multiply this waste (½ gallon) by the number of worn nozzles on a spray rig, 12 for example, and a total of 6 gallons of spray would be wasted each day.

Increased discharge by worn nozzles can be remedied in two ways. Either replace worn nozzle parts, or reduce the number of nozzles on the spray boom so the total discharge from all nozzles will not exceed recommended dosage rates.