POTENTIAL IMPORTANCE OF DEW TO MAIZE GROWTH AND DEVELOPMENT IN SEMIARID REGIONSOF DOUKALA, ABDA AND CHAOUIA

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ABSTRACT

The amount of dew received by maize (Zea mays L.) plants grown under rainfed conditions in semiarid regions is important and necessary for maize growth and development. Therefore, the amount of dew must be included in water balance equation for maize in these regions. Consequently, studies on the amounts of dew received and absorbed by plants in Moroccan semiarid regions should be initiated. These studies should quantify the positive effects of dew from near the Atlantic Ocean to about 70 km inland. The information obtained will help the maize breeder in define the appropriate architecture of maize plants for climatic conditions in these regions.

RESUME

La quantité de rosée reçue dans les zones semi arides est importante et nécessaire pour la croissance et le développement des plantes de maïs. Par conséquent, il faudra l'inclure dans l'équation de la balance d'eau pour le maïs non-irrigué. Etant donné le rôle important de la rosée dans ces zones ; la quantité reçue et absorbé par la plante du maïs doit être étudiée dans les zones de Doukala, Abda et Chaouia. Les résultats obtenus peuvent aider l'améliorateur dans la sélection de types de plantes de maïs qui ont les charactères morphologiques les plus adéquates pour mieux croître et se développer dans les conditions climatiques dans ces régions.

I- INTROCUCTION

The most important zone for maize cultivation in Morocco is the coastal area between Casablanca and Essaouira. This area consits of 300.000 ha of rainfed maize, extending 60 to 70 km inland. The average annual rainfall in Casablanca is less than 4OO mm. This amount decreases southward and eastward and its distribution is highly variable from year to year. Less than 30 % of the rainfall is received during maize growing season. Temperatures are usually low in the winter ; consequently maize is not planted until February or March in these regions. Low rainfall at the end of winter and during the spring prevent normal growth and development. Therefore, the national average grain yield is less than 1000 kg/ha.

II- MAIZE WATER REQUIREMENT

Water is the most important determinant of maize growth and development. Shaw (1977) reported that water available to maize may come from current rainfall, soil moisture stored before planting, or irrigation. Minor amounts may come from dew. Maize requires 410 to 640 mm of water (Hanway, 1966). This is much higher than the amount of water available for maize in Doukala, Abda and Chaouia. Other supplementary sources of water must be provided in these regions for maize to produce higher yields.

III- DEW AND ITS CHARACTERISTICS

Tuller and Chilton (1973) stated that one form of precipitation that is often neglected in describing a region's moisture balance is dew. In arid and semiarid regions, dew can account for an appreciable proportion of available moisture. Wallin (1966) reported that investigators disagree on the amount of benefit plants derive from dew, but agree that dew benefits plants in the absence of other moisture sources primarily in arid and desert areas.

Burrage (1972), Duvdevani (1963) and Monteith and Rutter (1975) stated that the amount of dew formed depends on radiation, temperature, humidity, and wind speed. Duvdevani (1963) and Raman et al. (1973) reported that the amount of dew condensing on vegetation could be two to four times of recorded values. In Ohio, U. S. A., Harold and Dreibelbis (1951) cited by Wallin (1966), found that over a six-year period the average dew deposition was equivalent to 230 mm of rain and approximately 20 % of the total water supply. Raman et al. (1973) reported that in some regions of India dewfall exceeds 25 mm for a six-month period ; up to 0,4 to 0,45 mm were received in a single night. Burrage (1972) found that dewfall ranged from 0,02 to 0,33 mm/night, and Kerr and Beardsell (1975) reported amounts varying between 0,28 and 0,46 mm/night.

Dew duration on plants has been studied by many investigators. Duvdevani (1963) stated that dew persistance depends on a number of factors such as intensity of the deposit and the type of vegetation. He reported that dew may persist for 3,5 to 5 hours after sunrise. In England, Burrage (1972) found that duration was between 4 and 14 hours per night. Baier (1966) reported that plants may remain moisture-coated for 12 to 15 hours.

Duvdevani (1963) reported that the amount of dew deposition on plants varied with different plants and with different leaves of the same plants depending on height, age and exposure. Duvdevani (1953), cited by Chang (1968), reported that maximum dewfall occurred at on meter and decreased downward toward the soil surface. Raman et al. (1973) found that accumulation on lower surfaces is generally insignificant compared to condensation on upper surfaces.

IV- EFFECT OF DEW ON PLANT WATER STATUS

Baier (1966) stated that the influence of dew on the physiology and water status of the plant may be more important than the percentage of daily consumption of water furnished by dew. Waisel (1958), cited by Monteith and Rutter (1975), measured the uptake of dew by a number of Mediterranean trees, shrubs and some desert plants. Gains of water from a night of dew varied with species from negligible amounts to 12 % of leaf fresh weight. Potential evapotranspiration rates are 2 to 5 mm/day in the temperate summer and 5 to 10 mm/day in subtropical conditions (Monteith and Rutter, 1975). Tuller and Chilton (1975) found that only 3 % of the monthly potential evapotranspiration was met by dew during the summer. Duvdevani (1963) found that dew can contribute large amounts of moisture during dry periods. Plants which received dew continued to grow and develop, in contrast to plants without dew which withered. Free water on plants can affect the water balance in two ways :

a)- directly by entry of water into the plant and
b)- indirectly by reducing transpiration (Slatyer, 1967).

Boyer (1970) reported that leaf enlargement was more inhibited than photosynthesis by low leaf water potential. Growth data also showed that a minimal turgor pressure is required for a rapid cell enlargement. Kerr and Beardsell (1975) found that when dew was on leaves of **Paspalum dilatatum** water potential remained higher than it did without dew. Hoffman (1973) reported that plants grown at low humidity had lower osmotic and turgor potentials than plants grown at high humidity. He found also that in maize, cotton, and pepper, water use efficiency was increased over 100 percent by high humidity.

V- POTENTIAL ROLE OF DEW IN MAIZE PERFORMANCE IN MOROCCAN SEMIARID REGIONS

The above review shows that dew can be of great importance in regions where rainfall is insufficient for normal growth and development. In Moroccan semiarid regions dew appears to contribute to growth and development of maize in the following ways :

a)- By furnishing water to leaves and cells, it creates a higher turgor pressure in the cells and consequently cell and plant growth.
b)- The water entering the cells helps delay morning moisture deficit stress for a few hours.

c)- It contributes to the required humidity level for pollination and fertilization.

d)- Generally, dew is a buffer against the negative effects of drought which may occur during different phases of the growing season and might affect plant development.

From this review we can see that even if the amount of rainfall is much lower than the maize water requirement and the rainfall distribution is highly variable, maize can still grow and produce green matter and grain in Doukala, Abda and Chaouia.

Since dew is important for maize growth and development in semiarid regions studies should be undertaken in these regions to quantify positive effects of dew on different maize varieties with different morphological characters such as leaf area in order recognize criteria useful for screening for adaptation to climatic conditions in these regions.

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