Not all shrivels are created equal—morpho-anatomical and compositional characteristics differ among different shrivel types that develop during ripening of

Vitis vinifera L.) Berries

ABSTRACT

An understanding of physiological disorders associated with ripening of fruits triggered by abiotic stress relies on anatomical and physico-chemical analyses, as it provide insights into their origin and probable causes. The objective of this study was to analyze different ripening disorders of grape (Vitis vinifera L.) berries by dissecting their morpho-anatomy, shriveling nature, and composition. Four well-defined disorders—sunburn, prolonged dehydration (PD), late-season bunch stem necrosis (LBSN), and berry shrivel (BS) were analyzed in field-grown grapevines of the cultivar Cabernet Sauvignon. Early bunch stem necrosis (EBSN) that occurred before ripening was also included in the study. Unlike healthy spherical berries, the pericarp of disordered berries except for sunburn shriveled causing concomitant reductions in fresh weight and volume. The exocarp of PD berries developed well-ordered indentations as distinct from the wrinkles in LBSN berries, whereas BS berries were flaccid with numerous skin folds. The epicuticular wax occurred as upright platelets in all shrivel forms excluding the sun-exposed hemisphere of sunburned berries. A chlorophyllous inflorescence framework persisted in all shrivel forms but in LBSN, wherein the necrotic regions developed tylosis. Unlike the translucent mesocarp of healthy, sunburned, and PD berries, the mesocarp was collapsed in BS and LBSN berries, nevertheless all had well-developed seeds. The composition of healthy berries was optimal, whereas the disordered berries were compositionally distinct from each other, which as a whole differed from the healthy berries. The BS berries had the lowest sugar content, and although sugar concentration was higher in LBSN, sunburned and PD berries, sugar amount per berry was highest in the healthy berries, the same was true for hexoses. Healthy and BS berries exhibited highest amounts of tartaric acid followed by sunburn and PD berries, whereas the LBSN berries had the lowest values. Conversely, healthy and PD berries had the highest amounts of malic acid followed by LBSN, sunburn and BS berries, which collectively displayed similar amounts. The PD berries exhibited the highest calcium content followed by LBSN, healthy, and finally BS and sunburned berries. A linear relationship existed between potassium (K) and pH of the berries. The PD berries had the highest amounts of K followed by healthy, sunburn, LBSN, and BS berries. Overall, the results reported here provided combined morpho-anatomical and compositional analyses of different shrivel types that occurred during a single growing season. Such analysis is needed to make a progress on understanding these ripening disorders culminating in the development of remedial measures.

KEYWORDS

Grape; Bunch Stem; Dehydration; Necrosis; Ripening; Shrivel; Sunburn; Vitis vinifera

Conflicts of Interest

The authors declare no conflicts of interest.

Cite this paper

B. Bondada and M. Keller, "Not All Shrivels Are Created Equal—Morpho-Anatomical and Compositional Characteristics Differ among Different Shrivel Types That Develop during Ripening of Grape (Vitis vinifera L.) Berries," American
References


All the compositional forms can be found in each of the types of narration but with strongly varying frequencies. Exercise I. Find examples of various types of narration and narrative compositional forms. Pay attention to language means used in each one. State their functions. Discuss correlations existing between the type of narration, compositional form and the language of the discourse: 1. Novelists write for countless different reasons: for money, for fame, for reviewers, for parents, for friends, for loved ones; for vanity, for pride, for curiosity, for amusement; as skilled furniture-mak 2012. Not all shrivels are created equal – morpho-anatomical and compositional characteristics vary among different shrivel forms that develop during ripening of grape (Vitis vinifera L.) berries. American Journal of Plant Science 3: 879-898. (Cover article, see sidebar – right). Bondada, B. and M. Keller. 2012. Morpho-anatomical symptomatology and osmotic behavior of grape berry shrivel. Journal of the American Society for Horticultural Science 137:20-30. Structural and fruit compositional anomalies related to various shrivel types developing during ripening of grape berries. Authors: B. Bondada, M. Keller. Keywords: grape, bunch stem, dehydration, necrosis, ripening, shrivel, sunburn, Vitis vinifera. DOI The objective of this study was to analyze different kinds of shrivels that afflict grape (Vitis vinifera L.) berries during their growth and development by dissecting their morpho-anatomy and shriveling nature, and analyzing fruit composition. Common to all shrivel types was the loss of volume despite retaining an intact morphology of epicuticular wax that occurred as upright platelets excluding on the sun-exposed hemisphere of SB berries wherein its crystalline structure was transitioned into amorphous masses.