Description of cultivar

VCS-Tornasol: cultivar of white forage sorghum for the state of Sinaloa

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Abstract

Mexico is the fourth world producer of sorghum (*Sorghum bicolor* L. Moench.) with a 10% of world production, 94.3% goes to the production of balanced feed for livestock. In Sinaloa, 70% of the sorghum is grown under rainy season conditions corresponding to the spring summer cycle, with average yields of 1.29 t ha^{-1} of grain and 9.54 t ha^{-1} of green fodder. In recent years it has been possible to identify new genotypes with greater tolerance to diseases than commercial hybrids, so in the program of genetic improvement of sorghum of the Valley of Culiacan Experimental Field the variety 'VCS-Tornasol' was released, which presents greater tolerance a: ergot caused by *Claviceps african*, anthracnose caused by *Colletotrichum graminícola*, blight of the panicle caused by *Fusarium moniliforme* and carbonaceous rot of the stem caused by *Macrophomina phaseolina*. It is currently registered in the National Catalog of Plant Varieties (CNVV) of the SINCS with the number SOG-285-231117 and number of breeder's title 1889. The variety VCS-Tornasol is of intermediate vegetative cycle, has a plant height of 2.40 m, its spikes are medium (24 cm), semicompact, with good excersion (30 cm), the grain is cream or amber, circular and semi-flat, with testa and endosperm crystalline and medium texture. In yield trials carried out over a period of six years during the spring-summer cycle under temporary, VCS-Tornasol yielded an average of 3 100 kg ha^{-1} of grain, exceeding by 9.67% the average of three commercial controls, the production of low forage temporary conditions yielded on average 39 775 kg ha^{-1}, surpassing 49.21% to the average of the commercial control.

Keywords: *Sorghum bicolor* L., forage, grain, resistance to diseases.

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Mexico is the fourth world producer of sorghum (*Sorghum bicolor* L. Moench.) with a 10% share of world production; however, it is the main importer of this grain with an average volume of 2.35 million tons (SIAP, 2018). In Mexico, 94.3% of sorghum is used for the production of balanced feed for livestock production and in recent years, there has been an increase in consumption in the country (Gámez-González *et al*., 2010).

In Sinaloa, 70% of sorghum is grown under rainy season conditions corresponding to the spring summer cycle, with average yields of 1.29 t ha^{-1} grain and 9.54 t ha^{-1} green fodder, respectively (SIAP, 2018). Among the main problems facing the cultivation of sorghum in Sinaloa are drought, as well as the scarce use of conservation practices and use of moisture.

In recent years, it has been possible to identify new genotypes with greater disease tolerance than commercial hybrids, among them the new variety VCS-Tornasol that has greater tolerance to: ergot caused by *Claviceps african*, anthracnose caused by *Colletotrichum graminícola*, blight of the panicle caused by *Fusarium moniliforme* and carbonaceous rot of the stem caused by *Macrophomina phaseolina* (Williams-Alanis *et al*., 2009).

The Genetic Improvement Program of Sorghum of the Valley of Culiacan Experimental Field (CEVACU) of the National Institute of Forestry, Agriculture and Livestock Research (INIFAP), released the new variety 'VCS-Tornasol' in 2017, which was obtained through genetic recombination and selection. The germplasm that gave rise to this variety was introduced during 1986 to CEVACU, in Sinaloa, Mexico, from the International Institute for the Improvement of Crops of the Semi-Arid Tropics International Crops Research Institute for the Semiarid Tropics (ICRISAT), Hyderabad, India. His progenitor lines were an androsterile female and a male restorer of fertility, of unknown genealogy; to the cross was assigned the denomination V-2 (Variety-2).

The selection of the segregating material of the V-2 cross was initiated from generation F2, by the groove method per panicle or pedigree for seven generations. In this way, the advanced uniform line was obtained that gave rise to 'VCS-Tornasol', and whose pedigree is: V2-1-M-3-1-1-2-M-M.

From 2002 to 2012, this variety was evaluated in yield trials under rainfed and irrigated conditions, in several locations in the state of Sinaloa, Mexico. It is currently registered in the National Catalog of Plant Varieties (CNVV) of the SINCS with the number SOG-285-231117 and breeder's title number 1889.

The description of the variety of sorghum, was made using the descriptors of the Union of Variety Producers and Breeders (UPOV), in the south and center of Sinaloa, where the predominant climate is dry tropic, with precipitation between 450 and 600 mm, during the spring-summer cycle in rainy or dry season conditions, the VCS-Tornasol variety has an intermediate vegetative cycle, with 65 to 70 days at flowering and 115 to 120 days at harvest, it has a plant height of 2.4 m, its leaves are light green, medium texture, without anthocyanins; its stem has eight internodes at maturity and the juice of this one has a concentration of soluble solids of 18 to 19 ºBrix, when the plants have the doughy milky grain. It has medium spikes (24 cm), semi-compact, with good excersion (30 cm) and glumes without anthocyanins in flowering; the grain is cream or amber, circular and semi-flat, with a crystalline testa and endosperm, and medium texture.

In yield trials conducted over a period of six years (1999 to 2005) during the spring-summer cycle under temporary, VCS-Tornasol yielded on average 3 100 kg ha^{-1} of grain exceeding 9.67% to the average of three commercial controls.

During the spring-summer 2006 to 2012 seasons, forage production was evaluated under rainfed conditions, VCS-Tornasol yielded an average of 39 775 kg ha^{-1}, surpassing 49.21% of the commercial control average.

The bromatological quality of the irrigated forage, during the autumn-winter cycles of 2006 to 2012, was 77.99% of digestibility and 6.32% of protein, exceeding in digestibility and in protein content the commercial control with 21.79 and 0.52%, respectively, by which is considered to VCS-Tornasol as a dual-purpose material (Hernandez-Espinal *et al*., 2010).

On the other hand, in the physical and chemical analysis of sorghum grains it was found that the physical dimensions of this variety (length, width and thickness) are 4.14, 3.95 and 2.5 mm, respectively, while the weight of 1 000 grains of the variety VCS-Tornasol is 27 ±0.5g.

The chemical composition of the sorghum grains VCS-Tornasol showed a content percentage of proteins, lipids, ashes and carbohydrates of 10.02, 3.39, 1.62 and 84.97%, respectively. Therefore, with the agronomic characteristics of the forage and the physical and chemical characteristics of sorghum grains, VCS-Tornasol is proposed as a new potential variety to be cultivated in the state of Sinaloa (Figure 1 and 2).

Figure 1. Plant of the variety of sorghum 'VCS-Tornasol' reproduced in Culiacán, Sinaloa.

Figure 2. Representative panicle of the variety 'VCS-Tornasol' reproduced in Culiacán, Sinaloa.

Conclusions

Due to the national demand of genotypes tolerant to diseases and drought, INIFAP makes available to the public seed 'VCS-Tornasol'. Producers interested in acquiring the seed can go to the Valley of Culiacan Experimental Field and present their request for seed needs.

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