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SHORT COMMUNICATION

Identification of Chilli Genotypes through Chemical Tests

J. Padma[1*], K. Sivasubramaniam[2] and S. Anbu[3]
[1,2]Dept. of Seed Science and Technology, Agricultural College and Research Institute, Madurai, TN, India;
[3]Dept. of Biochemistry, Sacred Heart College (Autonomous), Tirupattur-635601, Vellore, TN, India
jpadmasst@gmail.com*; +91 9488704785

Abstract

Investigations were carried out to study the varietal characterization of chilli varieties, CCH1 hybrid and its parents through chemical tests. Potassium hydroxide and ferrous sulphate solutions were found to be useful for identification of female parent (Sln1) of CCH1 chilli hybrid and sodium hydroxide test was useful to differentiate PKM1 chilli genotype. These chemical tests were first of its kind used in identifying chilli seed.

Keywords: Chilli seeds, genotype, chemical tests, varietal identification, color reaction.

Introduction

Characterization of genotypes assumes importance with the implementation of Protection of Plant Varieties and Farmer Rights Act (PPV and FRA). A variety is distinguished through a set of morphological characteristics, which are helpful in establishing distinctness, uniformity and stability. It involves comparison of varieties using number of qualitative and quantitative morphological traits observed in field raised under Grow out Test. It is expensive and time consuming venture requiring large area and skilled personnel. Chilli (*Capsicum annuum* L.) a solanaceous vegetable, native to new world tropics and sub-tropics was introduced into India from Brazil. The world production is 70 LT from 15 L ha with India, China, Pakistan occupying major acreage and India is the leader in production and consumption of chilli followed by Pakistan and China. Chilli cultivation is mostly concentrated in the southern states like, Andhra Pradesh, Karnataka, Maharashtra, Orissa with Andhra Pradesh accounting for nearly 25% of the total area in India. Of late, chilli varieties have been introduced both by public and private sectors due to importance of chilli in Indian cuisine underscoring the need for identification of a particular variety from other varieties, an essential component of plant variety protection. Many of the morphological traits possess multigenic expression which is altered by environmental factors. These limitations are overcome by rapid and reliable methods of varietal identification and genetic purity testing and the best alterative way to speed up the testing procedure is to use chemical tests which have not been attempted to group chilli genotypes so far. Chemicals have good scope in varietal identification and they are very quick, easy and reproducible (Reddy *et al*., 2008). Keeping the above points in account, this investigation was carried out to study the varietal characterization of chilli varieties, CCH1 hybrid and its parents through chemical tests.

Materials and methods

Collection of seeds: The seed material utilized for the present investigation comprised of TNAU released hybrids and varieties viz., CO1, CO2, PKM1, PMK1, PLR1, K1, K2, KKM1, hybrid CCH1 and its parental line (Sln1 and CA97). The chemical tests were carried out in the laboratory of Dept. of Seed Science and Technology, AC and RI, Madurai.

Phenol test: Two replications of 50 seeds each were soaked in 50 mL of MilliQ water for 16 h followed equi-spacing in petri dishes containing filter paper moistened with 6 mL of Phenol solution (0.1%) and kept at ambient temperature. The seeds were examined for staining after 8 h and 10 h and grouped in to color categories viz., light brown, dark brown or mars brown (Namarta *et al*., 2007).

Modified phenol test: The standardized phenol test for varietal purity testing as suggested by Bora *et al*. (2008) with slight modifications was followed. Two replications of 50 seeds each were soaked in 50 mL of 4% $CuSO_4$ for 16 h and placed in petri dishes lined with filter paper moistened using 4 mL of Phenol solution (0.1%) and kept at ambient temperature. After 4 h and 8 h, the seeds were examined for staining and graded based on color as light brown or deep olive, black, dark brown or mars brown color (Reddy *et al*., 2008).

Potassium hydroxide test: Four replications of 50 seeds in each cultivar were soaked in 50 mL of 0.1% potassium hydroxide and kept at room temperature for 5 h. The solution was observed for deep-wine red staining (Vanangamudi *et al*., 1988).

Sodium hydroxide test: Four replications of 50 seeds of each genotype were soaked in 50 mL of 0.1% solution of NaOH and kept at room temperature for 5 h.

Table 1. Categorization of chilli genotypes based seed coat color change due to chemical tests.

Chilli variety/hybrid	Phenol test	Modified phenol test	KOH test	NaOH test	$FeSO_4$ test
CO2	No change	No change	Light yellow	Light yellow	No change
PLR1	No change	No change	Light yellow	Light yellow	No change
PKM1	No change	No change	Light yellow	Reddish yellow	No change
PMK1	No change	No change	Light yellow	Light yellow	No change
K1	No change	No change	Light yellow	Light yellow	No change
KKM1	No change	No change	Light yellow	Light yellow	No change
CO1	No change	No change	Light yellow	Light yellow	No change
K 2	No change	No change	Light yellow	Light yellow	No change
CA 97	No change	No change	Light yellow	Light yellow	No change
Sln1	No change	No change	Reddish yellow	Light yellow	Black
CCH1	No change	No change	Light yellow	Light yellow	No change

The solution was observed for deep-wine red staining (Reddy *et al*., 2008).

Ferrous sulphate test: Four replications of 50 seeds of each genotype were soaked in 50 mL of 0.5% $FeSO_4$ solution for 4 h at 25°C. Based on the seed color, development varieties were grouped as grey, light grey, dark grey and black (Bora *et al*., 2008).

Results and discussion

The phenol and modified phenol tests did not stain different chilli genotypes rendering all genotypes undistinguishable and grouping was not possible (Table 1). The reason attributed for lack of phenol color reaction may be due to the absence of Tyrosinase enzyme in seed coat or lack of highly specific and monogenically controlled response localized in seed coat. However, several researchers have successfully used phenol and modified phenol test of differentiating seeds of cotton varieties (Ponnuswamy *et al*., 2003), rice (Kondo and Kasahara, 1940; Walls, 1965; Abrol and Uprety, 1972; Sivasubramanian and Ramakrishnan, 1974; Steen *et al*., 1986; Janaiah *et al*., 2003), in wheat (Singhal and Prakash, 1988; ISTA, 2004) and in cereals (Csala, 1972; Chakrabarty *et al*., 2007). Potassium hydroxide soaking led to varied color reactions of seed soak solution and the genotypes were grouped as light yellow (CO1, CO2, PKM1, PMK1, PLR1, K1, K2, KKM1, hybrid CCH1 and male of CA97) and reddish yellow (Sln1). Among the genotypes, KOH test was found to be useful for the differentiating the genotype of Sln1 from the rest of the genotypes. Similarly, the sodium hydroxide soaking led to the genotypes being grouped as light yellow (CO1, CO2, PKM1, PMK1, PLR1, K1, K2, KKM1, hybrid CCH1, Sln1 and CA 97) and reddish yellow (PKM1). Here, the NaOH test was able to differentiate PKM 1 from the rest of the genotypes studied. Color reaction of seed soak solution of both the chemicals may be due to inherent chemical difference or secondary metabolites present in the seed coat and may be a stable genetic character (Chakrabarty and Agarwal, 1989; Khare *et al*., 2006). The ferrous sulphate test also could not differentiate among the genotypes except for Sln1. Sln1 seed solution turned black while other genotypes remained colorless.

The results are in conformity with findings of Vashisht *et al*. (2011) in cotton for ferrous sulphate test was useful to test the genetic purity of Vishwanath and Varalakshmi hybrids. The chilli genotypes did not show any significant response and color pattern to phenol and modified phenol. However, potassium hydroxide and ferrous sulphate tests were useful for identification of chilli genotype Sln1 and sodium hydroxide for PKM1 were found to be useful for identifying and grouping chilli genotypes.

Conclusion

Potassium hydroxide and ferrous sulphate solutions were found to be useful for identification of female parent (Sln1) of CCH1 chilli hybrid and sodium hydroxide test was useful to differentiate PKM1 chilli genotype.

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