

Original Research Article

Screening of *Aloe vera* Germplasms in Natural Field Condition against Base Rot Diseased caused by *Fusarium spp.*

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ABSTRACT

Aloe barbadensis (L.) Burn. Fil. popularly known as *Aloe vera*, is a perennial, drought resistance, succulent medicinal herb belongs to the family Liliaceae. Twenty six germplasms of *Aloe vera* were screened for their reaction to *Fusarium sp.* by field conditions. It is evident from the result presented in table 2 that during 2018-19 and 2019-20, out of 26 germplasms in 2018-19 of *Aloe vera* screened, none of germplasms was found immune, highly resistant, resistant and moderately resistant, seven germplasms viz., IC-310611, IC-310596, IC-310618, IC-471886, IC-112527, IC-285626 and IC-112512 were observed as found susceptible, nineteen germplasms viz., IC-285629, IC-310904, IC-310609, IC-283610, IC-112532, IC-112519, IC-310517, IC-112569, IC-112513, IC-112531, IC-310617, IC-112521, IC-283945, IC-283655, IC-283943, IC-111279, IC-471882, IC-112518 and IC-111280 highly susceptible. The seven germplasms were observed as found susceptible and nineteen germplasms, were observed as found highly susceptible and next year twenty six germplasms, ten germplasms were observed as found susceptible and sixteen germplasms, were observed as found highly susceptible.

Keywords

Aloe vera,
germplasms, base
rot, immune,

Introduction

Aloe barbadensis (L.) Burn. Fil. popularly known as *Aloe vera*, is a perennial, drought resistance, succulent medicinal herb belongs to the family Liliaceae. There are over 300 species of *Aloe*, among them *Aloe barbadensis* Miller (*Aloe vera* or "true *Aloe*") plant which has been of most use to mankind because of the medicinal properties it displays. The plant stands 30-36 inches high, and a mature leaf is 2.5-3 inches wide at the

base, weighing 1.5 to 2 kg. The ancient records of the Egyptians, Arab, African, Asians and Americans have discussed the different uses and pathological cases in which *Aloes* was administered (Singh *et al.*, 2012). The various names for *Aloe vera* are Kumaarika (Sanskrit), Gheekanwar (Hindi), GhritaKumari, Kumaari, Indian *Aloe* (English), Kuwaargandal (Punjabi), Kumari (Malyalam, Oriya), Chirukuttali (Tamil), Korepharh (Marathi) and ChinnaKalabanda (Telgu). The folk name of this plant is

“Kanniedood”, which means cannot die (Tiwari and Upadhyay 2018). It is grown in warm tropical areas and cannot survive freezing temperature. The *Aloe* plant is a stemless or very short stemmed succulent plant growing to 60-100 cm long and leaves of *Aloe vera* grown from a short stalk near ground level in a rosette pattern. The leaves are glaucous-green in colour, fleshy, sessile, and crowded, erect spreading, and narrow lanceolate in 60 cm long, 10 cm broad and 1.8 cm thick. The flowers are produced on a spike up to 90 cm tall, each flower pendulous, with a yellow tubular corolla 2-3 cm long. The central portion of *Aloe* leaves contain gel known as *Aloe vera* gel, has bad odour with bitter taste. The gel is most important component of plant and has great medicinal value; each leaf is composed of three layers: (1) An inner clear gel (2) the middle layer of latex which is the bitter yellow sap (3) the outer thick layer of 15-20 cells called as rind which has protective function. Inside the rind are vascular bundles responsible for transportation of substances such as water (xylem) and starch (phloem). The scientists have discovered over all 150 nutritional ingredients in *Aloe vera* and all work together in a synergistic way to create healing and health given benefits. The ten main areas of chemical constituents of *Aloe vera* include amino acid, anthraquinones, enzymes, minerals, vitamins, lignins, monosaccharides, polysaccharides, salicylic acid, saponins and steroids (Barcroft and Myskja, 2009). The most important of protecting the plants against the fungal attack is the use of fungicides. However, many fungicidal agents available in the market are toxic and have undesirable effects on other organisms present in the environment some synthetic fungicides are non-biodegradable, and hence can accumulate in the soil, plants and water, and consequently affect the humans through the food chain. Therefore, it is desirable to use some ecofriendly measures

for the management of diseases (Tapwal *et al.*, 2011).

It is used for its laxative, anti-inflammatory, immunostimulant and antiseptic effect (Capasso *et al.*, 1998) found very effective for the treatment of wounds, skin diseases, reduces blood sugars in diabetes, arthritic swelling, and constipation and pile (Rajendra *et al.*, 2007) as medicinal herb, *Aloe vera* has been used extremely to treat various skin conditions such as cuts, burns and eczema. *Aloe* plants can be used for treatment of asthma, ulcer and diabetes (Daodu 2000; Djeraba and Quere 2000; Olusegun 2000). It is all alleged that sap from *Aloe vera* eases pain and reduces inflammation (Davis and Moro, 1989).

The essential fatty acids in *Aloe vera* are beneficial, not only nutritional but also act as anti-inflammatory agent. It has minimum of three anti-inflammatory fatty acids, which help in smooth functioning of the stomach, small intestines and colon. It has a natural property to alkalise digestive juices which prevents over-acidity. The *Aloe vera* juice concentrate are high in essential enzymes, which stimulates digestion and liver functions. The synergistic effect of *Aloe vera* juice used in combination with a few other herbs does wonders as a liver-cleaning agent. *Aloe vera* supplements also contain a rare natural ingredient called saponins, which is provided by nature to cleanse and flush out waste products and toxins (Kumar *et al.*, 2010). The central bulk of the leaf contains colourless mucilaginous pulp (*Aloe vera* gel), made up of large, thin walled mesophyll cells.

The plant contains 95-96% water and over 75 other constituents which include vitamins, minerals, enzyme, sugars, phenolic compounds, saponins and amino acids (Boudreau and Beland 2006). It is highly

appreciated due to its short growth period and highly economic value. In India the plant is mainly cultivated in Uttar Pradesh, Uttarakhand, Rajasthan, Andhra Pradesh, Gujarat, Madhya Pradesh and Maharashtra. Total production of *Aloe vera* in India has been estimated to be 1, 00,000 tonnes (Dubey and Pandey 2009).

Materials and Methods

The experiment on *Aloe barbadensis* was conducted during the course of investigation in 2018-19 and 2019-20 at A.N.D.U.A. & T. Kumarganj, Ayodhya (U.P.). Twenty six germplasms of *Aloe vera* were obtained from the MAP (Medicinal and Aromatic Plantation) The Percent disease intensity (PDI) was calculated by formula as given below:

$$\text{Percent disease intensity (PDI)} = \frac{\text{Sum of total numerical}}{\text{Total No.of leaves examined} \times \text{highest rating}} \times 100$$

The *Aloe vera* germplasms were collected and their reaction against the disease was noted. Data will be recorded using 0-5 disease rating scale (Banerjee and Kallo1987).

Results and Discussion

Twenty six germplasms of *Aloe vera* were screened for their reaction to *Fusarium* sp. by field conditions. It is evident from the result presented in (Table 3) that during 2018-19 and 2019-20, out of 26 germplasms in 2018-19 of *Aloe vera* screened, none of germplasms was found immune, highly resistant, resistant and moderately resistant, seven germplasms viz., IC-310611, IC-310596, IC-310618, IC-471886, IC-112527, IC-285626 and IC-112512 were observed as found susceptible, nineteen germplasms viz., IC-285629, IC-310904, IC-310609, IC-

283610, IC-112532, IC-112519, IC-310517, IC-112569, IC-112513, IC-112531, IC-310617, IC-112521, IC-283945, IC-283655, IC-283943, IC-111279, IC-471882, IC-112518 and IC-111280 highly susceptible. During 2019-20 out of 26 germplasms in *Aloe vera* screened, none of germplasms was found immune, highly resistant, resistant and moderately resistant, ten germplasms viz., IC-310611, IC-310596, IC-310904, IC-283610, IC-310618, IC-112532, IC-112519, IC-471886, IC-112527 and IC-112512 were observed as found susceptible, sixteen germplasms viz., IC-285629, IC-310609, IC-310617, IC-112569, IC-112513, IC-112531, IC-310517, IC-112521, IC-283945, IC-285626, IC-283655, IC-283943, IC-111279, IC-471882, IC-112518 and IC-111280 highly susceptible.

The similar result was obtained by (Mathur and Shekhawat1992; Mandhare and Patil1993; Singh and Singh1998; Etebarian *et al.*, 2001). (Kaushal and Singh 1990) screened forty four lines of chickpea were screened for resistance to *Fusarium oxysporum* f. sp. *ciceris*. Fourteen lines were found to be resistant, and of these ICC85107 and ICC12263 were totally free of any infection. (Kishore *et al.*, 2012) screened germplasms/varieties to find out the sources of resistance against *Fusarium oxysporum* f. sp. *lini*. Out of total 78 entries, 27 cultivars were found to be resistant to disease as the disease incidence in these cultivars were between 0 and 10%. Twenty three cultivars fell in moderately resistant category with 10,125% wilt incidence. Nine genotypes were found moderately susceptible showing 25,150% disease incidence, 14 genotypes were found susceptible showing 50,175% and 6 genotypes were found highly susceptible to disease (above 75%). (Kumar *et al.*, 2018) the experiment was conducted to evaluate the genotypes of *Aloe vera* against leaf rot disease.

Table.1 List of germplasms of *Aloe vera*

S. No.	Germplasms	S. No.	Germplasms
1.	IC-285629	14.	IC-112527
2.	IC-310611	15.	IC-112531
3.	IC-310596	16.	IC-310617
4.	IC-310904	17.	IC-112521
5.	IC-310609	18.	IC-283945
6.	IC-283610	19.	IC-285626
7.	IC-310618	20.	IC-283655
8.	IC-112532	21.	IC-283943
9.	IC-112519	22.	IC-111279
10.	IC-310517	23.	IC-112512
11.	IC-112569	24.	IC-471882 (Check)
12.	IC-471886	25.	IC-112518
13.	IC-112513	26.	IC-111280

Table.2 Disease scale (0-5)

S=. No.	Severity grade	Disease %	Reactions
1.	0	No visible disease	Immune
2.	1	1 % area covered by spots	Highly Resistant
3.	2	1-10% area covered by spots	Resistant
4.	3	11-25% area covered by spots	Moderately Resistant
5.	4	26-50% area covered by spots	Susceptible
6.	5	50 above	Highly Susceptible

Table.3 Screening of *Aloe vera* germplasms against base rot caused by *Fusarium* sp. under field conditions during 2018-19 and 2019-20

S. No.	Grade	2018-19		2019-20		
		Germplasms	No. of Germplasms	Germplasms	No. of Germplasms	Reaction
1.	0	Nil	0	Nil	0	Immune
2.	1	Nil	0	Nil	0	Highly Resistant
3.	2	Nil	0	Nil	0	Resistant
4.	3	Nil	0	Nil		Moderately Resistant
5.	4	IC-310611, IC-310596, IC-310618, IC-471886, IC-112527, IC-285626, IC-112512,	7	IC-310611, IC-310596, IC-310904, IC-283610, IC-112518, IC-112532, IC-112519, IC-471886, IC-112527, IC-112512,	10	Susceptible
6.	5	IC-285629, IC-310904, IC-310609, IC-283610, IC-112532, IC-112519, IC-310517, IC-112569, IC-112513, IC-112531, IC-310617, IC-112521, IC-283945, IC-283655, IC-283943, IC-111279, IC-471882, IC-112518 and IC-111280	19	IC-285629, IC-310609, IC-310617, IC-112569, IC-112513, IC-112531, IC-310517, IC-112521, IC-283945, IC-285626, IC-283655, IC-283943, IC-111279, IC-471882, IC-112518 and IC-111280	16	Highly Susceptible

Out of 26 genotypes, none of genotypes was found the free from disease, three genotypes viz., IC-111280, IC-112531 and IC-112513 were highly resistant, four genotypes viz., IC-111279, IC-112518, IC-285626 and IC-283655 were resistant, nine genotypes viz., IC-310618, IC-471886, IC-310904, IC-112569, IC-112519, IC-112532, IC-310611, IC-310617 and IC-310596 were moderately resistant and rest of the genotype were moderately susceptible to highly susceptible against the disease.

The twenty six germplasms of *Aloe vera* were screened for their reaction to *Fusarium* sp. out of twenty six germplasms, seven germplasms were observed as found susceptible and nineteen germplasms, were observed as found highly susceptible in 2018-19. The twenty six germplasms of *Aloe vera* were screened for their reaction to *Fusarium* sp. out of twenty six germplasms, ten germplasms were observed as found susceptible and sixteen germplasms, were observed as found highly susceptible in 2019-20.

Acknowledgements

The co-authors are thankful to Dr. SK Pande, A.N.D.U.A. & T. Kumarganj, Ayodhya-224229 (U.P.), for providing of germplasms and providing of necessary facilities to conduct experiment and Dr. Ajay Kumar for his critical comments on the manuscript.

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