

Original Research Article

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Effect of Botanicals Seed Treatment for Seed Vigour of Maize Variety Vivek 27

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ABSTRACT

Keywords

Botanical extracts,
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In this study the data pertaining to effect of five botanicals on Vivek 27 variety seed quality parameter of Vivek 27 variety revealed that seed treatment with Neem+ Tulsi, Neem+ Onion, Neem+ Garlic, Neem + Ginger were significantly superior over control. Neem extract seed treatment with combination other botanicals showed values range of per cent germination 91.00 ± 3.83 (Neem+ Ginger) to 98.00 ± 3.21 (Neem+ Tulsi), fresh weight (g) 8.47 ± 0.63 (Neem+ Garlic) to 13.06 ± 0.59 (Neem+ Tulsi), dry weight (g) 2.52 ± 0.16 (Neem+ Garlic) to 3.70 ± 0.15 (Neem+ Tulsi), and seedling vigour index- dry weight 232.49 ± 33.02 (Neem+ Ginger) to 358.95 ± 15.45 (Neem+ Tulsi) at ratio 1:1, 2:1 and 1:2. However, Neem+Ginger ratio (2:1) and (1:2) minimum values of per cent germination 93 ± 3.83 and 91.00 ± 3.83 , fresh weight (g) 8.78 ± 1.86 and 8.67 ± 1.98 , dry weight (g) 2.60 ± 0.47 and 2.57 ± 0.50 and seedling vigour index- dry weight 232.49 ± 33.02 and 232.49 ± 53.50 , were showed. The botanical extracts are cheaper and eco-friendly practice for the control of seed-borne pathogens of maize.

Introduction

Maize (*Zea mays* ssp. *mays* L., $2n=20$.) has worldwide significance as human food, animal feed and as raw material for the manufacture of hundreds of industrial products. Presently, maize is being used mainly for feed (63 per cent), food (23 per cent), starch industries (12 per cent) and seed and miscellaneous use (2 per cent) in India. It is estimated that by 2025, India would require 50 MT maize grain, of which 32 MT would be required in the feed sector, 15 MT in the

industrial sector, 2 MT as food, and 1 MT for seed and miscellaneous purposes (Yadav *et al.*, 2016). Demand for food poses major challenges to humankind due to rising population. For facing these challenges humans used enormous amount of chemically synthesized fungicides because of their enormous use, easiness and extreme effectiveness to control plant diseases. Due to their harmful effects on human being as well as soil health, nowadays focus is shifting in the direction of biopesticides to manage plant diseases as they have no adverse consequence

on humans as well as environment. Many factors may be responsible for mold growth, among them are adverse weather conditions, the high cost of mechanical drying, insect and rodent damage, and temperature differentials which cause moisture movement during storage and transport (Pitt, 1981). Mold growth in turn will cause loss of germinability, discoloration, loss of milling properties, rancidity from free fatty acid production, spoilage, and mycotoxin production. Fungal deterioration of stored grains is a chronic problem in the Indian storage system. When fungi associate with grains, they often reduce both the quality and yield of grains (Baliukoniene *et al.*, 2003).

The active principles of the many drugs found in plants are secondary metabolites (Parekh *et al.*, 2006). Medicinal plants are a source of great economic value all over the world. About three quarter of the world's population relies on plants and plant extracts for healthcare (Parekh and Chanda, 2008). Twelve thousand secondary metabolite have been isolated and the number estimated to be less than 10 per cent of the total (Latha and Dubey, 2010; Sangvikar and Wadje, 2012). Different mechanisms of action of phytochemicals have been suggested. They may inhibit microorganisms, interfere with some metabolic processes or may modulate gene expression and signal transduction pathways (Kumar *et al.*, 2017; Manson 2003; Surh 2003). The mechanism of action is considered to be the disturbance of the cytoplasmic membrane, disrupting the proton motive force, electron flow, active transport, and coagulation of cell contents (Kotzekidou *et al.*, 2008). Plant extracts as control measures are cost effective and non-toxic methods. Plant based antifungal formulation are now being used (Uddin, 2013). In present investigation, Effect of various plant extracts on seed vigour of Maize variety Vivek 27 had been carried out.

Materials and Methods

Screening of plant extracts

Preparation of plant extract

Locally five plant extract were prepared by macerating leaves/ roots in ratios weight / volume (1:1) in distil sterilized water (DSW) and this extract is termed as standard extract (SE) (Table 1). Two hundred grams of fresh leaves from each plant were washed well and grinded in 200 ml of DSW by using grinder. The macerate was filtered through double layered cheese cloth and centrifuged at 3500 rpm for 20 minutes. The supernatant was filtered through Whatmann No. 42 filter paper. The supernatant was putted into oven at 50 °C till half volume before used. This supernatant is pure stock (100%).

Effect of seed treatments with botanicals on germination by multi-pot tray method (Khare, 1996)

The combination (Botanical: DSW) of botanicals 1:1, 2:1 and 1:2 were made from standard extracts. Seed was dipped for 60 minutes and dried in shade before showing (Kumar, 2011 and Pandit, 2010). Each treatments were four replications (25X4=100 Seeds). Different extracts were evaluated by multi-pot tray method (Khare, 1996).

Standard Germination Test (%)

One hundred seeds with four replications of maize variety Vivek -27 was tested in the laboratory according to the Rules of International Seed Testing Association (ISTA, 2011). The final count of germination was recorded on 5th day and the number of normal seedlings was counted and expressed as per cent germination.

$$G (\%) = [N_T \times 100]/N$$

Where,

N_T : proportion of germinated seeds in each treatment for the final measurement

N: Number of seeds used in bioassay

Seedling fresh weight (g)

Normal germinating seedlings in four replications each of all the varieties were selected in separate paper bags and the seedling fresh weight was measured in gram and average seedling fresh weight was calculated.

Seedling dry weight (g)

For dry weight determination, all replication of seedlings are removed and dried in 2-3 days in air. These seedlings were placed in separate paper bags and then transferred into oven at 50°C for 8 h four times. The average weight of all replications of germination seedlings was taken and seedling dry weight was expressed in grams.

Vigour index

Seedling vigour index was calculated according to the formula suggested by Abdul-Baki and Anderson (1973).

$$\text{Vigour index} = \frac{\text{Standard germination (\%)} \times \text{Seedling dry weight (g)}}{\text{Seedling dry weight (g)}}$$

Data analysis

Data for seed health parameters were summarized and analysed using SAS ver. 9.1 (SAS Institute Inc., Cary, NC, USA) within the framework of general linear models.

The means were separated using LSD ($p=0.05$) to determine whether there were significant differences among the among the seed quality parameter of Vivek 27 variety.

Results and Discussion

Data pertaining to effect of five botanicals on Vivek 27 variety seed are presented in Table 2 and Plate 1. Over all mean of all seed quality parameter of Vivek 27 variety revealed that seed treatment with Neem+ Tulsi, Neem+ Onion, Neem+ Garlic, Neem + Ginger were significantly superior over control. Among the four seed quality parameters *viz.*, germination (GN), fresh weight (FW), dry weight (DW) and seedling vigour index- dry weight (SV) was recorded. In case of Neem extract seed treatment (1:1) with combination other botanicals showed values range of per cent germination 97.00±3.83 (Neem+ Tulsi) to 92.00±3.26 (Neem+ Ginger), fresh weight (g) 13.06±0.59 (Neem+ Tulsi) to 9.72±0.76 (Neem+ Onion), dry weight (g) 3.70±0.15 (Neem+ Tulsi) to 3.17±0.16 (Neem+ Garlic), and seedling vigour index- dry weight 358.95±15.45 (Neem+ Tulsi) to 262.86±19.77 (Neem+ Ginger) and Neem+ Tulsi seed treatment(1:1) was achieved highest values of per cent germination-97.00±3.83, fresh weight (g)-13.06±0.59, dry weight (g)-3.70±0.15 and seedling vigour index- dry weight 358.95±15.45. Neem+Tulsi ratio (2:1) and (1:2) maximum values of per cent germination 98.00±2.31 and 96.00±3.26, fresh weight (g) 11.67±0.71 and 8.70±1.16, dry weight (g) 3.35±0.18 and 2.58±0.30 and seedling vigour index- dry weight 327.66±15.22 and 247.36±26.11, were showed.

Neem+Onion combination values of per cent germination 96.00±3.26 and 94.00±5.16, fresh weight (g) 11.04±2.27 and 10.16±1.68, dry weight (g) 3.18±0.58 and 2.96±0.43 and seedling vigour index- dry weight 305.45±55.98 and 279.06±53.36 were obtained at ratio (2:1) and (1:2), respectively. Neem+Garlic seed treatment were achieved values of per cent germination 95.00±3.83, fresh weight (g) 10.85±1.19, dry weight (g)

3.13±0.31 and seedling vigour index- dry weight 297.05±21.65 at ratio 2:1. At ratio 1:2 were showed values of per cent germination

93.00±5.03, fresh weight (g) 8.47±0.63, dry weight (g) 2.52±0.16 and seedling vigour index- dry weight 234.24±9.46.

Table.1 The particulars of botanicals used for seed treatment is given below

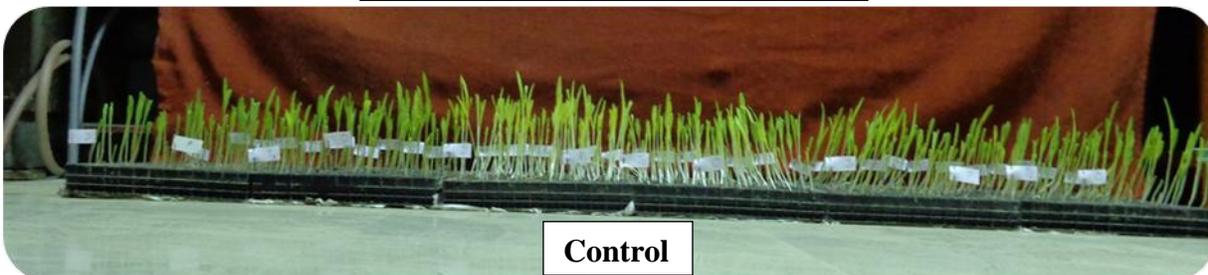
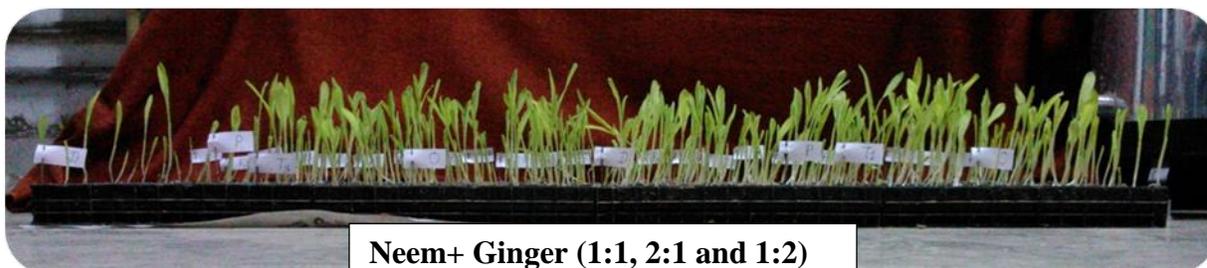
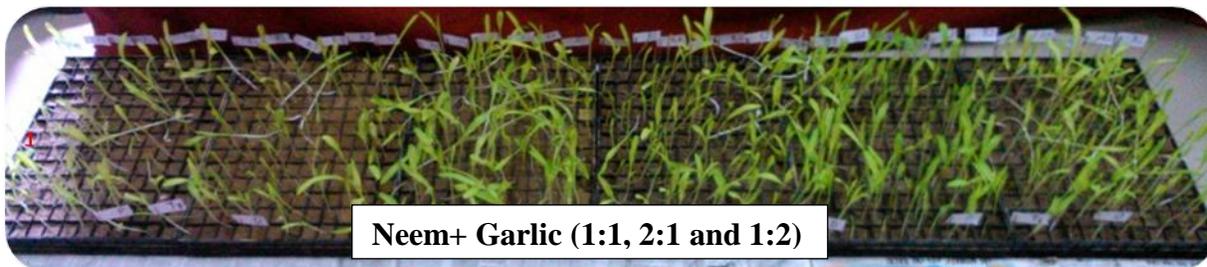
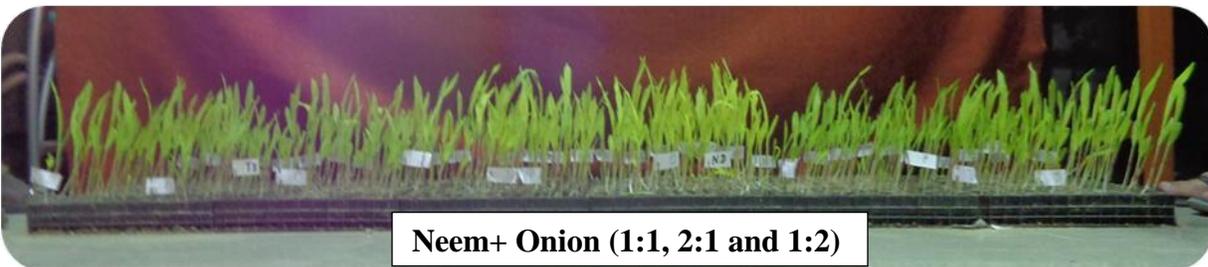
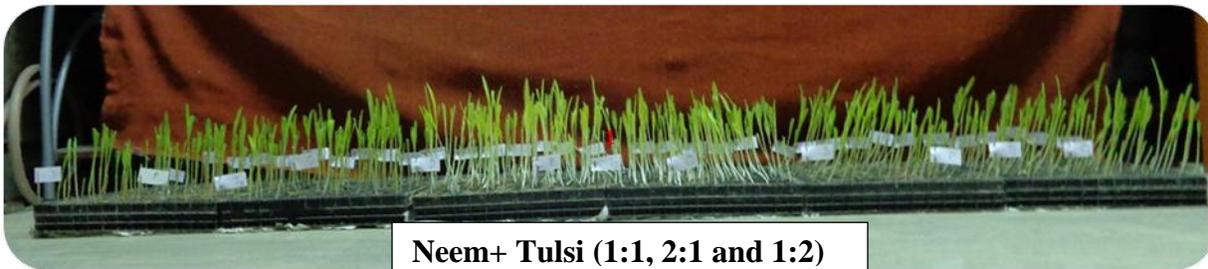
S. No.	Common /English name	Botanical Name	Family	Plant parts used	Active substance
1.	Neem/ Indian-lilac/ Margosa (India)	<i>Azadirachta indica A. Juss</i>	Meliaceae	Leaves	Azadirachtin: Limonoids/ tetranortriterpenes (Roy and Saraf, 2006)
2.	Tulsi/Basil (India)	<i>Ocimum sanctum L.</i>	Lamiaceae	Leaves	Ocimene, camphor, g-terpineol, methyl cinnamate (Hussain <i>et al.</i> , 2008)
3.	Onion/ Payaj (Central Asia)	<i>Alliumcepa L.</i>	Amaryllidaceae	Bulbs	Quercetin, Dimethyl trisulfide (Marrelli <i>et al.</i> , 2019)
4.	Garlic/ Lahsun (Central Asia)	<i>Allium sativum L.</i>	Amaryllidaceae	Cloves	Diallyl disulfide, Diallyl trisulfide, allyl propyl disulfide (Hussein <i>et al.</i> , 2017)
5.	Ginger/ Adrakh (South-East Asia)	<i>Zingiber officinale Rosc.</i>	Zingiberaceae	Rhizomes	Gingerol, zingerone (Mohamedin <i>et al.</i> , 2018)

Table.2 Effect of botanicals on maize variety Vivek 27 seed dressing through multipots tray method

Treatments	Concentration Ratio	Germination (in %)	Fresh Weight (in gm)	Dry Weight (in gm)	Seedling Vigour index
Neem+ Tulsi	1:1	97.00±3.83a	13.06±0.59a	3.70±0.15a	358.95±15.45a
	2:1	98.00±2.31a	11.67±0.71a	3.35±0.18a	327.66±15.22a
	1:2	96.00±3.26a	8.70±1.16b	2.58±0.30b	247.36±26.11b
Neem+Onion	1:1	95.00±3.82ab	9.72±0.76b	2.85±0.19ab	269.88±17.51b
	2:1	96.00±3.26a	11.04±2.27a	3.18±0.58a	305.45±55.98a
	1:2	94.00±5.16ab	10.16±1.68ab	2.96±0.43ab	279.06±53.36a
Neem+Garlic	1:1	94.00±4.00 ab	10.97±0.63ab	3.17±0.16a	297.19±5.93a
	2:1	95.00±3.83ab	10.85±1.19ab	3.13±0.31a	297.05±21.65a
	1:2	93.00±5.03 ab	8.47±0.63b	2.52±0.16b	234.24±9.46b
Neem+Ginger	1:1	92.00±3.26ab	10.03±0.57ab	2.92±0.14ab	262.86±19.77b
	2:1	93±3.83ab	8.78±1.86c	2.60±0.47b	232.49±33.02c
	1:2	91.00±3.83b	8.67±1.98b	2.57±0.50b	232.49±53.50b
Control		90.00±6.93b	8.52±0.59c	2.53±0.15c	232.86±7.58b
MSD (P= 0.05)		5.3912	1.4711	0.3776	36.1440
EMS		21.4730	1.5988	0.1054	965.1576

Note: MSD= Minimum significant difference, EMS= Error mean square and Tukey's Studentized Range Test

Plate.1



• Plate 1: Neem and other botanicals combination

Interaction effect between different concentration ratio and botanicals treatments showed significant difference with respect to control at level $P= 0.05$. Neem+Ginger ratio

(2:1) and (1:2) minimum values of per cent germination 93 ± 3.83 and 91.00 ± 3.83 , fresh weight (g) 8.78 ± 1.86 and 8.67 ± 1.98 , dry weight (g) 2.60 ± 0.47 and 2.57 ± 0.50 and

seedling vigour index- dry weight 232.49±33.02 and 232.49±53.50, were showed.

There is no report on effect of botanicals seed treatment for seed vigour of Maize in literature. So, seed invigouration done midway during storage has been reported to improve the seed viability and vigour during subsequent storage. The chemically treated seeds generally store better in storage and show better field performance (Pegah *et al.*, 2008).

In conclusion, in the present findings, Neem+Tulsi seed treatment (1:1) was achieved highest values of per cent germination- 97.00±3.83, fresh weight (g)- 13.06±0.59, dry weight (g)- 3.70±0.15 and seedling vigour index- dry weight 358.95±15.45. Therefore, botanical extracts are cheaper and eco-friendly practice for the seed-borne diseases of maize. This may provide a better management of the seed-borne diseases.

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