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Effect of seed soaking in leaf extract and seed coating with leaf powder on seed germination and seedling vigour in sunflower

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Abstract: Sunflower seeds of cv. Morden were soaked in water or leaf extract (1%) of *Prosopis, Azadirachta* (Neem), *Cyanodon, Bougainvilla, Vitax, Acacia, Pongamia, Hibiscus, Moringa* and *Tamarindus* (Tamarind) for 16h and dried back to original moisture content. Soaked and dried seeds were evaluated for seed germination and root and shoot length of seedlings. In another experiment, seeds were coated with dried leaf powders of plant species used in the previous experiment at 250 g kg^{-1} of seed using maida 5 per cent as adhesive. Soaking and drying in leaf extract of *Bougainvilla* and *Vitax* recorded maximum germination. However, root and shoot length of seedlings were maximum in seeds soaked in water. *Moringa* leaf extract significantly reduced seed germination. However, in seed coating experiment *Moringa* leaf powder proved to be the best for enhancing seed germination and vigour.

Key words : Sunflower, Leaf powder, Soaking and Drying, Coating, Seed Germination, Vigour.

Introduction

Among the annual oil seeds, sunflower (*Helianthus annus* L.) offers a great potential as it can effectively be fitted to different regions, situations, seasons and cropping systems. Photo and thermo-insensitivity of sunflower has been observed to be greater than in any other oil seed. This leads added advantage to sunflower in the prevailing and potential cropping systems. Due to high oil content, sunflower seeds often posses low germination and vigour. An effective pre sowing treatment to enhance the germination and vigour is required. The plant products have shown a great promise for seed soaking and coating treatments in vegetables (Nargis, 1995); Viswanatha Reddy, 1995), sorghum (Jegathambal, 1996), and paddy (Nagaraj, 1996). However, no such attempt involving plant products have been made in sunflower. Hence, experiments were conducted to evaluate the performance of soaking and drying in leaf extract and leaf powder coating on seed quality of sunflower.

Materials and Methods

Seeds of sunflower cv. Morden were soaked in fresh leaf extract (1%) of *Prosopis, Azadirachta, Cyanodon, Bougainvilla, Vitax, Acacia, Pongamia, Hibiscus, Moringa* or *Tamarindus* for 16h at a seed to solution ratio of 1:1.25 (Previously standardised). For a comparison, soaking was done in mere water also. After soaking, seeds were dried under shade to original moisture content and then evaluated for seed germination in roll towel medium (ISTA, 1999) and root and shoot length of 10 randomly selected normal seedlings at the time of germination count on 7^{th} day.

In another experiment, seeds of sunflower cv. Morden were coated with dried leaf powders of the same plant species used in seed soaking experiment. Dried leaf powders at 250 g kg^{-1} seed were coated on the seeds using 5 per cent maida (starch) solution at 150 ml kg^{-1} seed as adhesive. The coated and uncoated seeds were evaluated for germination, root and shoot length of seeding, dry weight of 10 normal seedlings and vigour index (Abdul - Baki and Anderson, 1973).

The data collected from the experiments conducted during the year 2000 were statiscally analysed (Panse and Sukhatme, 1967) under CRD with four replications.

Table 1. Effect of seed soaking and drying with leaf extracts (1%) on germination and vigour in sunflower cv. Morden

Treatments	Germination (%)	Shoot length (cm)	Root length (cm)
Control	92 (9.6)	13.9	21.7
Water	97 (9.9)	19.0	25.5
Prosopis	96 (9.8)	13.8	23.5
Azadirachta	94 (9.7)	15.8	22.7
Cyanodon	90 (9.5)	14.7	24.4
Bougainvilla	99 (9.9)	15.8	23.0
Vitax	99 (10.0)	16.5	22.2
Acacia	92 (9.6)	15.7	22.1
Pungamia	95 (9.8)	15.1	20.3
Hibiscus	89 (9.4)	16.4	25.2
Moringa	89 (9.4)	16.4	25.2
Tamarindus	92 (9.6)	15.1	19.7
CD (P=0.05)	(0.26)	1.56	2.48

Figures in parentheses are square root values

Table 2. Effect of seed coating with leaf powders on seed quality in sunflower cv. Morden

Treatments	Germination (%)	Shoot length (cm)	Root length (cm)	Dry weight (mg)	Vigour index
Control	78 (61.7)	14.2	16.0	302	2,340
Prosopis	81 (64.2)	15.5	18.0	310	2,715
Azadirachta	80 (63.5)	15.4	17.6	304	2,352
Cyanodon	80 (63.5)	15.9	17.6	299	2,293
Bougainvilla	78 (62.2)	15.5	16.0	320	2,466
Vitax	80 (63.3)	16.8	18.6	314	2,825
Acacia	80 (63.7)	16.0	18.5	316	2,769
Pungamia	84 (66.2)	14.5	17.0	307	2,637
Hibiscus	81 (64.4)	14	17.3	321	2,542
Moringa	90 (71.9)	16.	20.5	344	3,339
Tamarindus	80 (63.6)	17	19.5	324	2,922
CD (P=0.05)	1.08	0.77	0.77	1.17	127.2

Figures in parentheses are arc sine values

Results and Discussion

Soaking seeds in *Bougainvilla* and *Vitax* recorded maximum germination of 99 per cent compared to 92 per cent in control. Seeds soaked water registered 97 per cent germination, which was on par with leaf extract soaked seeds (Table 1). Root and shoot lengths of seedlings were maximum only in water soaked seeds. Hence, it was clear that leaf extract at 1 per cent level did not confer any extra benefit. In fact, *Moringa* leaf extract caused signification reduction in germination and root length compared to control. Beneficial effects of soaking and drying treatment were probably due to enhanced metabolic functions, activation of respair mechanism at cellular level (Joseph and Nair, 1989). From the results, it was clear that, leaf extracts at 1 per cent level did not exert any extra benefit compared to water. In fact, *Maringa* leaf extract showed deleterious effect.

In contrast, coating with *Moringa* leaf powder recorded maximum germination of 90 per cent, which was 12 per cent higher than control. It was followed by *Pongamia* coated seeds (84%). The lowest germination was recorded in control and *Bougainvilla* coated seeds (78%). The seedling parameters *viz.* root (20.5 cm) and shoot length (16.5 cm) were also higher in *Moringa* coated seeds. Maximum accumulation of dry weight and vigour index were recorded by the same treatment (344 mg and 3339, respectively) followed by *Tamarindus* leaf coated seed. The lowest values were recorded by uncoated seeds (302 mg and 2,340, respectively) (Table 2).

Performance of dry leaf powder coating treatment were in the order of *Maringa, Pongamia, Prosopis, Hibiscus, Tamarindus, Azadirachta, Cyanodon, Vitax* and *Acacia* but all treatments out performed the uncoated control. Seed pelleting or coating is claimed to play a vital role in modern agriculture for precision planting and to supplement nutrition through seed for uniform and vigorous seedling growth. Miller and Scooter (1967) reported the possibility of getting desired plant population through seed pelleting. Mucke (1987) had stated that the coating materials improve seedling emergence at the changing soil moisture especially in sub optimal regimes.

For seed pelleting/coating, use of proper adhesive to bind the materials on seed surface is very essential, primarily the adhesive should be non-toxic. Besides, it should possess appropriate affinity for seed coat and selected substrate, required degree of water solubility, strength and plasticity to prevent breakage, dusting etc. The viscocity must be appropriate for easy application. In the present study, good binding was achieved with 5 per cent maida solution.

The investigation revealed that the coated seeds in general exerted a profound influence on germination and seedling growth. Among the treatments, seeds coated with leaf powders of *Moringa, Pongamia* and tamarind excelled over uncoated seeds in terms of germination, seedling length, dry weight and vigour index. Some biocontents present in the leaf powders might synergistically interact with amino acids especially tryptophan to form the indole acetic acid (IAA) in the germinating seeds to bring about enhancement in seedling growth. Identification of the active principle in leaf powder enhancing seed performance would be rewarding. Contrasting behaviour of *Moringa* leaf extract and dry leaf powder requires further elucidation.

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