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Effects of Vermiwash and different growing media on germination, seedling growth & longevity of BER seeds

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Abstract
A field experiment was conducted on "Effects of Vermiwash and different growing media on germination, seedling growth & longevity of Ber seeds (*Ziziphus mauritiana*) during *Rabi* season of 2021-22 with 9 treatments including control were conducted out in Randomized Block Design with three replications at Department of Horticulture, Sam Higginbottom University of Agriculture Technology & Sciences, Prayagraj, Uttar Pradesh. The treatments comprised T0; controlled (soil + water), T1: wood / saw dust + vermiwash 100%, T2: cocopeat + vermiwash 100%, T3: vermiculite + vermiwash 100%, T4 worm casting + vermiwash 100%, T5: wood/saw dust + vermiwash 50%, T6: cocopeat + vermiwash 50%, T7: vermiculite + vermiwash 50%, T8: worm casting + vermiwash 50%. The application of Worm casting + Vermiwash 100% showed maximum height (8.2cm), highest number of leaves (9 leaves), Stem diameter (0.4cm), Leaf area (3.37cm), seed vigour index (272), root shoot ratio (0.86), Dry weight of root (0.7gm), Dry weight of shoot (1.2gm), length of longest tap root(4.3cm) and initiated in less number of days (14 days) to germinate.

Keywords: Ber, growing media, vermiwash, worm casting

Introduction
Ber or Indian jujube (*Ziziphus mauritiana* Lamk.) which belongs to family Rhamenaceae is one of the most ancient and common fruits of Indian subcontinents and South Western China. The genus *Ziziphus* consists of 50 species of which 18-20 are indigenous to India. Ber is grown under rain-fed condition in arid and semi-arid regions of India and has been identified as highly draught and heat tolerant fruit crop.

It is deciduous and highly resistant to frost. Its draught hardiness, xerophytic nature, tolerance to salt (40 ESP and 12-15 dSm-1), deep tap root system, spiny nature and ability to shed its leaves during hot summer have helped the plant to adopt well to the arid and semi-arid conditions. It can be successfully cultivated even in the most marginal ecosystems of the subtropics and tropics. It is cultivated widely for its resistance to grow in drought and other diversified soil and climatic conditions. It is a hardy tree that copes with extremes temperature and thrives under dry conditions. Fruit quality is best under hot sunny and dry conditions but there should be a rainy season to support growth and flowering leaving enough soil moisture to carry the fruit to maturity. The ber plant is quick growing, early bearing and spreading tree. It has remarkable adoptability enabling to grow in wide range of agro-climatic situation and soils.

In ber, the bulk of fruit drop recorded at early stage of fruit development *i.e.*, during second fortnight of December. Drop occurs due to many reasons such as hormonal imbalance, abortion of embryo and inclement weather has been ascribed to drop immature fruits in ber. Recorded highest fruit drop in cultivar Seb (87.94%) followed by Umran 83.33%. Control of fruit drop and improvement of fruit quality can be achieved with the foliar application of plant growth regulators and nutrients.

Vermiwash is an extract of liquid, which is produced from the culture of richly populated earthworms. It consists of massive decomposer bacteria, vitamins, hormones, enzymes and different antimicrobial peptides. Earthworms establish symbiotic relations with microbes, produce an essential product that support the growth of plants, and suppress plants root disease. Thus, the present investigation was undertaken with the objective to determine the influence of different levels of treatment of seeds with vermiwash along with saw dust, cocopeat, vermiculite, and worm casting.

Materials and Methods

The experiment was carried out during Rabi season of 2021 at central research farm, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh. The experiment was laid out in Randomized Block Design comprised of 3 replications and total 9 treatments *viz*. T0; controlled (soil + water), T1: wood / saw dust + vermiwash 100%, T2: cocopeat + vermiwash 100%, T3: vermiculite + vermiwash 100%, T4 worm casting + vermiwash 100%, T5: wood/ saw dust + vermiwash 50%, T6: cocopeat + vermiwash 50%, T7: vermiculite + vermiwash 50%, T8: worm casting + vermiwash 50%. The seeds are treated with Vermiwash (50% and 100%) for 24hrs before sowing and are sown in polybags containing different types of growth media (Saw dust, Cocopeat, Vermiculite and Worm casting). The growth parameters were recorded at periodical intervals of 30,60 and 90 DAS from the randomly selected five plants in each treatment. Statistically analysis was done for all the parameters in one-way Anova and means were compared at 5% probability level of significant results.

Result and Discussion

Effects of Vermiwash and different growing media on germination, seedling growth & longevity of BER seeds are given in table 1 & 2.

Table 1: Effects of vermiwash and different growing media on germination attributes of BER seeds.

S. No	Treatments	Days required for initiation of Germination	Days required for 50% germination	Germination percentage
1.	T0: Controlled (soil + water)	21	26	58
2.	T1: Wood/saw dust + 100% Vermiwash	18	23	91
3.	T2: Cocopeat + 100% Vermiwash	18	23	89
4.	T3: Vermiculite + 100% Vermiwash	17	22	91
5.	T4: Worm casting + 100% Vermiwash	14	20	96
6.	T5: Wood/saw dust + 50% Vermiwash	18	25	92
7.	T6: Cocopeat + 50% Vermiwash	18	23	90
8.	T7: Vermiculite + 50% Vermiwash	19	22	87
9.	T8: Worm casting + 50% Vermiwash	16	21	91
	F test	S	S	S
	S.EM (±)	1.42	1.27	1.74
	CD (P=0.05)	4.06	3.63	4.99

Table 2: Effects of vermiwash and different growing media on growth attributes of ber seeds.

S. No	Treatments	Height of seedling(cm)	Number of leaves	Stem diameter (cm)	Leaf area(cm)	Dry weight of shoot(g)	Dry weight of root(g)	Length of root tap(cm)	Root shoot ratio	Seed vigour index(g)
1.	T0: Controlled (soil +water)	6.1	6	0.3	2.5	0.5	0.2	2.5	0.40	110
2.	T1: Wood/saw dust + 100% Vermiwash	8.2	9	0.4	3.20	1.1	0.5	3.1	0.46	255
3.	T2: Cocopeat + 100% Vermiwash	7.0	7	0.4	3.17	0.9	0.6	3.0	0.67	199
4.	T3: Vermiculite + 100% Vermiwash	7.2	8	0.3	3.17	0.8	0.5	2.9	0.63	209
5.	T4: Worm casting + 100% Vermiwash	8.2	9	0.4	3.00	1.2	0.7	4.3	0.86	272
6.	T5: Wood/saw dust + 50% Vermiwash	7.9	7	0.4	3.20	1.0	0.6	4.1	0.60	258
7.	T6: Cocopeat + 50% Vermiwash	7.8	8	0.4	3.23	0.9	0.6	3.3	0.67	216
8.	T7: Vermiculite + 50% Vermiwash	8.0	7	0.4	3.30	0.8	0.6	2.9	0.61	183
9.	T8: Worm casting + 50%Vermiwash	7.8	8	0.4	3.27	1.1	0.7	3.9	0.64	230
	F test	S	S	S	S	S	S	S	S	S
	S.EM(±)	0.20	0.17	0.17	2.64	0.76	0.60	0.58	1.86	0.57
	CD(0.05)	0.58	0.50	0.65	7.54	2.17	1.73	1.68	5.31	1.63

Days required for initiation of germination

Minimum days required for initiation of germination (14 days) were recorded in media treated with T4: Worm casting + Vermiwash100% which was followed by the media treated with T8: Worm casting + Vermiwash 50% recorded (16 days).

Days required for 50% germination

Minimum days required for 50 percent germination (20 days) was recorded for media treated with T4: Worm casting + Vermiwash100% which was followed by the media treated with T8: Worm casting + Vermiwash 50% recorded (21 days).

Germination Percentage

Maximum germination percentage (96%) was recorded for media treated with T4: Worm casting + Vermiwash 100% which was followed by the media treated with T5: Wood/Saw dust + Vermiwash 50% recorded (92%), T8: Worm casting + Vermiwash 50% recorded (91%).

Height of seedling: At 90 DAS, Maximum height of seedling (8.2cm) was recorded for media treated with T1: Wood/Sawdust + Vermiwash 100% and T4: Worm casting + Vermiwash 100% followed by T7: Vermiculite + Vermiwash 50% recorded (8.0cm).

No of leaves per seedling

At 90 DAS, maximum number of leaves per seedling (9) was recorded for media treated with T4: Worm casting + Vermiwash 100%, and T1: Wood/Sawdust + Vermiwash 100%, followed by T6: Cocopeat + Vermiwash 50%, T3: Vermiculite + Vermiwash 100%, T8: Worm casting + Vermiwash 50% recorded (8).

Stem diameter
At 90 DAS, maximum diameter of stem (0.4) was recorded for media treated withT1: Wood/saw dust + vermiwash 100% T2: Cocopeat + Vermiwash 100%, T4: Worm casting + Vermiwash 100% and T5: Wood / sawdust + Vermiwash 50%, T6: Cocopeat + Vermiwash 50%, T7: Vermiculite + Vermiwash 50%, T8: Worm casting + Vermiwash 50% respectively.

Leaf area
At 90 DAS, maximum leaf area (3.37 cm 2) was recorded for media treated with T3: Vermiculite + Vermiwash 100% followed by T7: Vermiculite + Vermiwash 50% recorded (3.30 cm 2).

Dry weight of shoot
At 90 DAS, maximum dry weight of shoot (1.2 g) was recorded for media treated with T4: Worm casting + Vermiwash 100% followed by T1: Wood / sawdust + Vermiwash 100% recorded (1.1g).

Dry weight of root
At 90 DAS, maximum dry weight of shoot (0.7g) was recorded for media treated with T4: Worm casting + Vermiwash 100% & T8: Worm casting + Vermiwash 50% recorded.

Length of longest tap root
At 90 DAS, maximum length of longest root tap (4.3cm) was recorded for media treated with T4: Worm casting + Vermiwash 100% followed by T5: Wood/sawdust + Vermiwash 50% recorded (4.1cm).

Root Shoot ratio
At 90 DAS, maximum root shoot ratio (0.86) was recorded for media treated with T4: Worm casting + Vermiwash 100% followed by T6: Cocopeat + Vermiwash 50% recorded (0.67).

Seed vigour index
At 90 DAS, maximum seed vigor index (272) was recorded for media treated with T4: Worm casting + Vermiwash 100% followed T5: Wood / sawdust + Vermiwash 50% recorded (258), T1: Wood / sawdust + Vermiwash 100% recorded (255).

Conclusion
Based on experimental findings it was concluded that Treatment combination of wood / saw dust + Vermiwash 100%, Worm casting + Vermiwash 50%, worm casting + Vermiwash 100% should give utmost importance. Therefore, on the basis of results for ber propagation under Prayagraj region of Uttar Pradesh, treatment with worm casting + vermiwash 100% can be recommended to nursery growers and researchers to obtain maximum germination percentage, stem diameter, leaf area index, shoot growth and root growth.

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