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Comparison Between Seed Planting Methods

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Abstract: An experiment was conducted in Plant Physiology Division at NIA, Tandojam, to find out a suitable growing technique for germination and seedling growth of wheat (*Triticum aestivum* L.). Techniques used were: I) Inclined glass plate blotter, ii) Agar gel medium and iii) PVC Germinator. There were no significant differences among the three planting methods on the germination and seedling growth of wheat. However, PVC Germinators were convenient and inexpensive compared with the agar gel and inclined glass plate blotter methods.

Key words: Methods comparison, wheat, techniques

INTRODUCTION

There are many methods, which are commonly used in the research laboratories for checking seed germination like Petri dishes[1] inclined glass plate blotter[2-4] and agar gel methods[5], but these methods are costly.

In Plant Physiology Division of NIA, Tandojam, a new technique for checking the germination of seeds and seedling growth was developed, which is quite cheaper than the methods listed before[6].

MATERIALS AND METHODS

An experiment was conducted in the Plant Physiology Laboratory of NIA, Tandojam to study the comparison between seed planting methods and to find a suitable growing technique for germination and seedling growth.

Inclined glass plate blotter: Two mm thick glass plates were cut to a size of 15x15 cm. The glass plates and blotting paper sheets were washed with distilled water and dried in air. The blotting papers were cut into a size of 15x12 cm and 2x15 cm. The bigger pieces of blotting papers, wetted with distilled water and 1.0% saline solutions, was placed on the row of the seeds. Care was taken to provide a gap in between the two blotters on the upper side. This ensured a free access of air to the seed and they could be viewed from the top. Two cm long with 1 cm diameter polythene tubings slit longitudinally on one side were fixed on two sides of the glass plate pressing the ends of the blotters. A rubber band was fixed across the plate over the blotter strip and the polythene tubes keeping them firmly in the position. The rubber band was placed in such a way that it does not obstruct in any way the upward growth of the shoot. For that it should be placed just below the line of the seed rather than above or over the seed. Another rubber band was fixed similarly over two side tubes, about 4 cm from the lower end of plate. The plate was then placed in the polythene pocket (0.15 mm–thickness of sheet measuring 23x18 cm and containing 100 ml of respective solution. The plates were then placed on a plastic dishholding rack at an angle of 66° for germination.

Polyvinyl chloride plastic on: The Germinator consisted of PVC pipes of 5 cm internal diameter and 8.5 cm, one side of which was glued with nylon net and the other was left open. The net side was snuggedly fitted in a plastic glass, so that about 2.5 cm space was left vacant at the bottom. This space was filled with treatment solution to the point where it just touched the nylon net. Caryopses were planted over the net and the open end was covered with polyethylene sheets or bags and sealed with rubber band to make it air tight.

Agar gel medium: In the third method, 0.8% agar gel was prepared in distilled water or in 1.0% salinity in a microwave oven and then the molten agar was poured into wide mouthed Mason glass jars of 250 ml capacity. The glass jars were then kept on a table for half an hour to solidify the agar. Sterilized healthy wheat caryopses were then planted over the agar gel with the help of sterilized forcep. Glass jars were then covered with polythene bags avoid the loss of moisture. All the three experiments i.e. (I) inclined glass plate blotter method, (ii) PVC-Plastic on

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Germinators and (iii) 0.8% agar gel medium were then placed in an incubator maintained at 28±1°C for 72 h. After 72 h the three set-ups were transferred under a bank of fluorescent light (4500 lux) for further 48 h in a growth room (26±2°C). The experiment was terminated after completion of 120 h. Measurement of shoot and root lengths were recorded to their nearest millimeter (mm) and then immediately their fresh weight was determined. Shoot and root samples were then kept in brown paper bags and transferred to an oven for drying at 70±2°C for 48 h after which their weights were recorded.

RESULTS

Seedling growth, as measured by the shoot and root lengths were, almost similar under the three different methods. Shoot growth was comparatively better in inclined glass plate blotter method (8.08 cm) than the agar gel (7.30 cm) method under the normal growth conditions. Shoot growth was significantly reduced by the application of 1.0% salt solution. The maximum decrease of -31.31% was observed in glass plate blotter method, whereas in other two methods, the percentage decreases was at par with each other (Table 1). Like shoot length, the fresh weight of shoot followed the same pattern and the maximum reduction in fresh weight of shoot in glass plate blotter, agar gel and PVC-Plastic on Germinator compared to control were 48, 39 and 43%, respectively. In control treatment the dry matter of shoot was maximum in glass plate blotter than in the other two methods. Compared with control, dry weight was reduced to 36% in glass plate blotter method followed by 21 in PVD plastic on and 6% in agar gel when salinity stress was imposed. Root growth was significantly higher in agar gel method (9.48 cm), than in the glass plate blotter (6.47 cm) and in the PVC-Plastic on (6.16 cm) methods under normal growth conditions.

On the other hand root growth was significantly reduced by the application of 1.0% salt solution. The maximum decrease of -23.24% was observed in glass plate blotter whereas in agar gel and PVC-Plastic on methods it was -11.18 and -2.43%, respectively. Like root length, the fresh weights of root decreased in the same way. The highest root fresh weight of 1.38 g was recorded in agar gel, whereas in glass plate blotter and PVC-Plastic on it was 1.20 and 1.18 g, respectively. Due to salinity treatment, the maximum decrease of -30.86% was observed in glass plate blotter, while in agar gel and PVC-Plastic on it was -24.64 and -30.20%, respectively as compared to control (Table 2). The dry matter of root was 0.14 g in agar gel, which was the highest against glass plate blotter PVC-Plastic on methods in which dry matter was 0.11 g for each. Due to imposing salinity, the maximum reduction was observed in glass plate blotter and PVC-Plastic on, which was -18.18% for each, whereas in agar gel method the reduction was restricted to -7.14%, which was less than the other two methods.

Table 1: Effect of salinity and different growing methods on shoot growth of wheat (cv. Sind-83)

Experimental methods	Treatments	Shoot length (cm)	Fresh weight (g)	Dry weight (g)
Glass plate blotter	Control	8.08	2.40	0.28
	1.0%	5.55	1.26	0.18
		(-31.31)*	(-47.50)	(-35.70)
PVC-Plastic on	Control	7.56	1.55	0.19
	1.0%	6.17	0.88	0.15
		(-18.39)	(-43.23)	(-21.05)
Agar gel	Control	7.30	1.47	0.17
	1.0%	6.20	0.90	0.16
		(-15.06)	(-38.78)	(-5.90)
LSD. at 5%		0.52	0.15	0.01

*The figures in the parentheses indicate percent decrease over control

Table 2: Effect of salinity and different growing methods on root growth of wheat (cv. Sind-83)

Experimental methods	Treatments	Shoot length (cm)	Fresh weight (g)	Dry weight (g)
Glass plate blotter	Control	6.47	1.20	0.11
	1.0%	5.25	0.83	0.09
		(-23.24)*	(-30.86)	(-18.18)
PVC-Plastic on	Control	6.16	1.18	0.11
	1.0%	6.01	0.80	0.09
		(-2.43)	(-30.20)	(-18.18)
Agar gel	Control	9.48	1.38	0.14
	1.0%	8.42	1.04	0.13
		(-11.18)	(-24.64)	(-7.14)
LSD. at 5%		0.65	0.11	0.02

*The figures in the parentheses indicate percent decrease over control

DISCUSSION

The inclined glass plate blotter method has basic similarities with the Jones and Cobb[2] method and that of Peterson *et al.*[3]. In these two methods the plates were placed in a tray containing the treatments. Since the plates remained open they were liable to fungal infection which could spread rapidly from one plate to another. Whereas in the present modified method of Punjabi and Basu[4] plates were kept individually in polyethylene bag containing 20 to 30 ml of experimental solutions with two rows of holes on the top back side and they were placed at an angle of 66° in a plastic dish stand. Due to this modification, if fungal infection occurs it is restricted to that plate only. However, we came across with the following difficulties.

a) The glass plates are fragile and could be easily broken during handlings.
b) Polyethylene bags could be punctured easily.
c) Wheat roots get easily entangled with one another and thus it becomes difficult to get intact roots for observing their growth in length and number.

The agar gel was also a good medium. The seedling growth was good because there was no difficulty in finding an anchor on the surface of solidified agar gel for their growth. It was observed that in 10.75% agar gel medium growth of wheat seedling was satisfactory. Ansari *et al.*[1] also reported that agar gel growth media performed very well for the growth of wheat and rice seedlings up to 5 days. This method has the following limitations[5].

a) Wide mouthed Mason glass jars or beakers are very costly and are fragile.
b) Agar used in this experiment is quite expensive.
c) It is possible that beyond 120 h of growth, the 250 ml beaker/jar might also prove to be an imperfect container because of the height of the seedlings.

PVC-Plastic on Germinator is simple and inexpensive. In this method, locally available ordinary plastic glasses, a hollow PVC pipe and a nylon net is used.
This method has the following advantages:

a) It is expensive.
b) Roots do not entangle with each other and can be separated easily for measurements.
c) The seedling could be raised beyond 120 h.
d) Solutions can be changed easily without disturbing the plants.
e) PVC pipes and plastic glasses are unbreakable.

Although the results of the three growth methods (Table 1and 2) quite similar but the PVC-Plastic on Germinator was easy to use and the assembly was inexpensive. This method is currently being used extensively for germination studies of various crops in the laboratories of Plant Physiology and Plant Genetics Divisions of the NIA, Tandojam, Pakistan.

REFERENCE

1. Ansari, R., S.M. Naqvi and S.A. Ala, 1982. germination and seedling growth of various crop seeds as influenced by different growth media. Acta Agron. Acad. Sci. Hungaricae, 31: 351-354.
2. Jones, L.B. and R.D. Cobb, 1963. A technique for increasing the speed of laboratory germination testing. Proc. Ass. Seed Analysts, 53: 144-160.
3. Peterson, M.L., D.B. Jones and J.N. Rutger, 1978. Cool temperature screening of rice lines for seedling vigour. ILRiso, 27: 269-274.
4. Punjabi, B. and R.N. Basu, 1982. Testing germination and seedling growth by an inclined glass plate blotter method. Ind. J. Plant Physiol., 25: 289-295.
5. Naqvi, S.M., 1975. Effect of salinity on the nutritional pattern and developmental physiology of crop and the exploration of ameliorative measures. Final Report of the Pl. 480 Project No. A-17-SWC2.
6. Anonymous, 1975. Annual Report, AEARC, Tandojam, Pakistan, pp: 1975-1976.