

In-vitro Screening of Ascertain Crop for Different Soils Having Different pH

Tamoor Khan, Maqbool Ahmad*, Ahmad Ali* and Nizam Baloch**

PCSIR Laboratories Quetta, Agriculture Department Balochistan Quetta *, University of Balochistan, Quetta

In Pakistan, about 70% people directly and indirectly depend on Agriculture for their lives. Agriculture provides 25% GDP of Pakistan. Soils of Pakistan have severely been affected by alkalinity and salinity. Effects of different pH on seed germination of three major crops (wheat, Rice and Gram) varieties were studied. It was observed that Local White variety of Wheat crop was more resistant to a wide range of pH as compared to other two varieties. However, highest seed germination was observed in wheat variety Inqilaab at pH 7.6 (98%). All Rice crop varieties showed more tolerance than other crops (Wheat and Gram) against high pH. It has also been observed that Local variety in Gram crop showed more seed germination than other two varieties. The pH range for optimal seed germination in Gram crop was 7.5 to 8.5.

Key words: Wheat, rice, gram, pH, seed germination, alkalinity

Introduction

Pakistan enjoys a variety of climate from temperate to tropical and sub-tropical. A number of major crops grown in different pockets of Pakistan, Wheat, Rice, Cotton, Gram, Vegetables and Fruits are most growing crops of the country (Khosro, 1994). Pakistan is an Agricultural country. About 70% people of Pakistan directly and indirectly depend on this sector for their lives. Agriculture provides 25% GDP of Pakistan (Ginai, 1981). Soils of the country are mostly calcareous, with pH more than 7.8. Alkalinity and salinity problems are reducing the cultivation capability of soils and thousands of acres are losing its capability of crop production (Rathi, 1989; Arnon, 1972). It is feared, that if the situation remains same, we will lose most of our cultivable land. So, it is the need of the time to screen out such crops which are more tolerant to high and low pH. The present work is one of basic step toward this aspect.

Materials and Methods

1. Collection of Seed

Seeds of Wheat (*Local White, Inqilaab and Zardana*), Rice (*IRRI-6, DR-6 and Super Kernel*) and Gram (*Local*

Red, V-1 and V-2) were collected from Agriculture Research Institute Sariah Quetta and Federal Seed Certification Department Quetta.

2. Preparation of pH grades

Diluted HCL (5M) was used for acidifying the germinating media, whereas, diluted NaOH (5M) was used for alkalizing germinating media. Distilled water was used as germinating medium (Hemingway, 2005). Ten different pH grade solution ranging from pH 5.0 to 10.0 were prepared.

3. Effect of Different pH Grades on seed Germination

a) Soaking of seeds in pH grades

WHEAT. Thousand healthy seeds from all wheat varieties (*Inqilaab, Zardana and Local White*) were selected and thoroughly washed with tap water for about 2 minutes. Hundred seeds each from all varieties were separately rinsed in each grade of pH for about one hour (Mushtaq et al, 2005).

RICE. Thousand healthy seeds were randomly selected from all rice varieties (*IRRI-6, DR-86 and Super Kernel*). These were washed with tap water for about 2 minutes. Hundred seeds from each variety were soaked separately in all the grades of pH separately for one hour (Jones, 1926).

Corresponding Author:

E-Mail gumberani1@yahoo.com

GRAM. Thousand healthy seeds were randomly selected and washed with tap water for about 2 minutes. Hundred seeds from each variety were soaked separately in all the grades of pH, separately, for one (Singh, 1988).

b) Determination of pH effect on seed germination

Hundred soaked/treated seed were inoculated in 4 sterilized Petri Plates (25 seeds in each Petri Plate) containing two layers of blotting papers moistened by the respective pH grade (White, 1941). Same method was used for all other pH grades and crop varieties (Jonathan and Bugbee, 1999).

The seeds were allowed to germinate at 25 ± 2 °C (Patra et al, 2004).

Data was recorded after 10 days using standard methods for percentage germination (Gomez, 1984).

Results and Discussion

a. Effect of different pH grades on seed germination of wheat varieties.

Results have showed that Local White variety of wheat was well resistant to a wide range of pH grades as compared to Zardana, Inqilaab and Rasko-V5 (Table-1). This was due to well adaptation of Local variety to

very high and very low pH. However, generally production of this variety is low as compared to other varieties under normal conditions. Furthermore, a detailed breeding and genetic research is required to identify the pH resistant gene of Local White variety for isolation and recombination with a high yielding variety (Aman and Imtiaz, 2001).

b. Effect of different pH grades on seed germination of Rice varieties

Results indicate that all varieties of Rice crop showed characteristic suitability for alkaline soils (Table-2). However, IRRI-6 variety was found to be more resistant to different pH grades as compared to others Rice varieties.

c. Effect of different pH grades on seed germination of Gram varieties

Results in Gram crop were also showed that Local variety has tolerance against different pH grades as compared to others varieties. Maximum seed germination was observed in Local variety (97%) at pH Grade 7.5 (Table-3)

The optimal pH grades for Gram crop varieties are 7.5 to 8.5.

Table-I. Effect of different pH grades on seed germination of wheat varieties.

Varieties	Average number of seeds for each Grade		Seed Germination % for each pH Grade										Remarks
			5.0 10.0	5.5	6.0	6.5	7.5	8.0	8.5	9.0	9.5		
Local White	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 6.0 to 8.5
		Seeds germinated	30	43	66	78	92	90	73	43	10	07	
Inqilaab	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 7.5and 8.0
		Seeds germinated	07	10	39	52	98	88	33	20	13	08	
Zardana	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 7.5 to 8.5
		Seeds germinated	20	30	43	63	93	80	73	21	17	08	

Table 2. Effect of different pH grades on seed germination of Rice varieties.

Varieties	Average number of seeds for each Grade		Seed Germination % for each pH Grade											Remarks
			5.0	5.5	6.0	6.5	7.5	8.0	8.5	9.0	9.5	10.0		
IRRI-6	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 6.5to 9.0	
		Seeds germinated	25	28	70	79	92	90	88	88	50	30		
DR-6	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 6.5to 8.5	
		Seeds germinated	10	10	32	80	82	89	72	36	16	10		
Super-kernel	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 6.5to 8.5	
		Seeds germinated	12	16	51	86	95	92	90	50	43	31		

Table 3. Effect of different pH grades on seed germination of Gram varieties.

Varieties	Average number of seeds for each Grade		Seed Germination % for each pH Grade											Remarks
			5.0	5.5	6.0	6.5	7.5	8.0	8.5	9.0	9.5	10.0		
Local Red	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 6.0 to 8.0	
		Seeds germinated	35	51	90	92	97	75	60	60	20	10		
V-1	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 6.5 to 8.0	
		Seeds germinated	10	15	20	80	85	90	60	50	42	06		
V-2	100	Seeds Sown	100	100	100	100	100	100	100	100	100	100	Best pH 7.5 and 8.0	
		Seeds germinated	06	07	12	43	88	90	36	28	10	03		

Conclusion and Recommendations

The results revealed in this research showed that Local varieties in wheat and gram crops were more tolerated than other varieties. This may be due to more crops. Gram crop was showed more seed germination in all of its varieties at pH ranges from 7.5 to 8.5.

It is concluded that local varieties in wheat and gram are suitable varieties for a wide range of pH Rice crop is a suitable crop for soils having pH up to 9.0 (Alkaline).

adoptability of local varieties to its originated agro-ecosystem. In rice crop IRRI-6 showed more seed germination at pH ranges 7.5 to 8.5 as compared to other varieties. Generally Rice crop was more tolerated to high pH grades as compared to Wheat and gram Furthermore, it is recommended that a detailed research on evaluation of vigor, production and quality of crop in field capacity level should be carried out on these varieties.

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