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Effect of harvesting stages on seed quality of soybean (*Glycine max* L.) Varieties

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Abstract

The present investigation was conducted at the Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *kharif*-2018, with an aim to study the effect of harvesting stages (H_1 =One pod mature in plant, H_2 =Physiological maturity, H_3 =One week after physiological maturity, and H_4 =Two weeks after physiological maturity) on seed quality in different soybean varieties (V_1 =GS-1, V_2 =GS-2 and V_3 =GJS-3) in the field condition. The experiment was laid out in field as per Randomized Block Design (Factorial) with three replications. The characters *viz.*, fresh weight of hundred pods (g), dry weight of hundred pods (g), fresh weight of hundred seeds (g) and dry weight of hundred seeds (g) were recorded in the field. The experimental results revealed that irrespective of varieties, significantly the highest (36.11 g and 10.04 g) and the lowest (22.36 g and 7.02 g) dry weight of hundred pods and seeds were recorded in H_2 (Physiological maturity) and H_1 (One pod mature in plant) harvesting stages, respectively. Fresh and dry weight of pods were decreased significantly with advance in maturity, while dry weight of seeds and pods were increased up to physiological maturity and then decreased.

Keywords: Harvesting stages, seed production, seed quality, soybean, storage

Introduction

Soybean (*Glycine max* L.) is considered as miracle crop because of its dual qualities, *viz.*, high protein and oil content in seed. Soybean belongs to the family Fabaceae and sub family Papilionaceae with chromosome number $2n=20$. Soybean contains more protein (about 40-42 percent) than other pulses and a much higher content of edible oil (about 20 percent) (Gopalan *et al.*, 1994) [4]. In India, area, production and productivity of soybean in *kharif* 2015-16 were 11.60 million hectare, 85.69 million metric tons and 738 kg/ha. respectively, while in Gujarat area, production and productivity of soybean in *kharif*-2018 were 1.34 lakh hectare, 1.24 million metric tons and 925 kg/ha., respectively (Anon., 2018) [1]. The seed reaches its maximum dry weight at physiological maturity. As such harvesting of seed crop at optimum stage of seed maturation is essential to obtain better seed quality. Harvest of seed crop at right stage of maturity bear significant influence on seed yield and quality, as seeds harvested at right stage of physiological maturity are higher in seed quality on account of lesser field weathering (6). There is a need to ascertain the optimum stage of harvesting to obtain higher quality seeds.

Materials and Methods

The field experiment "Effect of harvesting stages on seed quality of soybean (*Glycine max* L.)" was conducted at the Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *kharif*-2018, with an aim to study the effect of harvesting stages (H_1 =One pod mature in plant, H_2 =Physiological maturity, H_3 =One week after physiological maturity and H_4 =Two weeks after physiological maturity) on seed quality in different soybean varieties (V_1 =GS-1, V_2 =GS-2 and V_3 =GJS-3) in the field condition. The characters *viz.*, fresh weight of hundred pods (g), dry weight of hundred pods (g), fresh weight of hundred seeds (g) and dry weight of hundred seeds (g) were recorded. The experiment was laid out in Randomized Block Design (Factorial) and data was analysed as per the method suggested by Cochran and Cox (1957) [2].

Result and Discussion

The seed quality parameters depend on the stage at which the seed crop is harvested. The results of the present study on influence of stages of harvest on seed quality in soybean varieties are presented in Table 1 and discussed here as under.

Fresh weight of hundred pods (g)

Different varieties of soybean noticed significant difference for fresh weight of hundred pods irrespective of harvesting stages. Significantly the highest fresh weight of hundred pods (48.59 g) was recorded in GJS-3 and the lowest fresh weight of hundred pods (29.18 g) in GS-1. This might be attributed to genetic makeup of different soybean varieties. Such varietal differences in fresh weight of hundred pods were also reported by Gynadev (2009) [3] in chickpea. Different stages of harvest exerted significant difference for fresh weight of hundred pods irrespective of different varieties tested. Significantly the highest (53.32 g) and the lowest (27.62 g) fresh weight of hundred pods was recorded in H₁ (One pod mature in plant) and H₄ (Two weeks after physiological maturity) harvesting stages, respectively. Such reduction in pod weight may be related to the moisture content of the seeds that decreased from R7 (One pod mature in plant) to R8 (Physiological maturity) and in the subsequent harvest times (Marcos-Filho *et al.*, 1994) [9]. The results are in accordance with the findings of Indira and Dharmalingam (1996) [5] in fenugreek; Kumar (2001) [8] in french bean; Gynadev (2009) [3] in chickpea and Ragupathi *et al.* (2017) [12] in proso millet.

Dry weight of hundred pods (g)

Different varieties of soybean show significant difference for dry weight of hundred pods irrespective of harvesting stages. Significantly the highest dry weight of hundred pods (36.78 g) was recorded in GJS-3 and lowest dry weight of hundred pods (21.25 g) in GS-1. This might be attributed to genetic makeup of different soybean varieties. Similar result for dry weight of hundred pods were also reported by Gynadev (2009) [3] in chickpea. Different stages of harvest exerted significant difference for dry weight of hundred pods irrespective of different varieties tested. Significantly the highest (36.11 g) and the lowest (22.36 g) dry weight of hundred pods was recorded in H₂ (Physiological maturity) and H₁ (One pod mature in plant) harvesting stages, respectively. Such reduction in pod weight may be related to the moisture content of the seeds that decreased from R7 (One pod mature in plant) to R8 (Physiological maturity) and in the subsequent harvest times (Marcos-Filho *et al.*, 1994) [9]. The results are in accordance with the findings of Indira and Dharmalingam (1996) [5] in fenugreek; Kumar (2001) [8] in french bean; Gynadev (2009) [3] in chickpea and Ragupathi *et al.* (2017) [12] in proso millet.

Fresh weight of hundred seeds (g)

Varieties exerted significant difference for fresh weight of hundred seeds. Irrespective of harvesting stages, significantly the highest fresh weight of hundred seeds (13.55 g) was recorded in GJS-3 and the lowest fresh weight of hundred seeds (10.30 g) was recorded in GS-1. This might be

attributed to genetic makeup of different soybean varieties. Such varietal differences in fresh weight of hundred seeds were also reported by Kharb *et al.* (1993) [6] in redgram, Gynadev (2009) [3] in chickpea and Sharma *et al.* (2013) [14] in groundnut. Irrespective of varieties, significantly the highest fresh weight of hundred seeds (17.35 g) was recorded, when harvested at H₁ (One pod mature in plant) followed by H₂ (Physiological maturity) with 12.36 g and H₃ (One week after physiological maturity) with 9.14 g, while the lowest fresh weight of hundred seeds (7.42 g) was noted in H₄ (Two weeks after physiological maturity) harvesting stage. Decrease in fresh weight of seed noticed with advance in maturity stages is mainly due to loss of moisture on account of dehydration (Sabir Ahmed, 1989) [13]. Similar decrease in fresh weight of seeds was also reported by Kharb *et al.* (1993) [6] in redgram; Indira and Dharmalingam (1996) [5] in fenugreek; Gynadev (2009) [3] in chickpea; Kumar (2001) [8] in french bean; Sharma *et al.* (2013) [14] in groundnut and Ragupathi *et al.* (2017) [12] in proso millet.

Dry weight of hundred seeds (g)

Different varieties of soybean exhibited significant difference for dry weight of hundred seeds irrespective of harvesting stages. Significantly the highest dry weight of hundred seeds (9.29 g) was recorded in GJS-3 which was at par with GS-2 (8.64 g), while the lowest dry weight of hundred seeds (7.12 g) was recorded in GS-1. This might be attributed to genetic makeup of different soybean varieties. Such varietal differences in dry weight of hundred seeds were also reported by Gynadev (2009) [3] in chickpea. Different stages of harvest exerted significant difference for dry weight of hundred pods irrespective of different varieties tested. Significantly the highest (10.04 g) and the lowest (7.02 g) dry weight of hundred pods was recorded in H₂ (Physiological maturity) and H₁ (One pod mature in plant) harvesting stages, respectively. All the varieties attained maximum dry matter accumulation at physiological maturity (Miles *et al.*, 1988 in soybean and Mehta *et al.*, 1993 in chickpea) [11, 10] thereafter, dry weight decreased because of restricted supply of nutrients from mother plant to seed due to disruption of vascular connection and utilization in various physiological and metabolic process (Khatun *et al.*, 2010 in chickpea) [7]. Decrease in dry weight of seed noticed with advance in maturity stages is mainly due to loss of moisture on account of dehydration (Sabir Ahmed, 1989) [13]. Decrease in dry weight noticed in soybean seeds which harvested after the maximum dry matter accumulation (Zuffo *et al.*, 2017) [15]. Similar trends were also reported by Kharb *et al.* (1993) [6] in redgram; Indira and Dharmalingam (1996) [5] in fenugreek; Kumar (2001) [8] in french bean; Gynadev (2009) [3] in chickpea; Sharma *et al.* (2013) [14] in groundnut and Ragupathi *et al.* (2017) [12] in proso millet.

Table 1: Influence of stage of harvest on fresh weight of hundred pods (g), dry weight of hundred pods (g), fresh weight of hundred seeds (g) and dry weight of hundred seeds (g) in soybean varieties

Treatments	Fresh weight of hundred pods (g)	Dry Weight of hundred pods (g)	Fresh weight of hundred seeds (g)	Dry weight of hundred seeds (g)
Varieties (V)				
GS-1 (V ₁)	29.18	21.25	10.30	7.12
GS-2 (V ₂)	39.88	29.75	10.85	8.64
GJS-3 (V ₃)	48.59	36.78	13.55	9.29
S. Em +	1.41	1.06	0.42	0.24
C. D. at 5%	4.13	3.11	1.23	0.72
Harvesting stages (H)				
One pod mature in plant (H ₁)	53.32	22.36	17.35	7.02

Physiological maturity (H ₂)	41.44	36.11	12.36	10.04
One week after physiological maturity (H ₃)	34.47	31.36	9.14	9.03
Two weeks after physiological maturity (H ₄)	27.62	27.22	7.42	7.33
S. Em +	1.63	1.23	0.48	0.28
C. D. at 5%	4.77	3.60	1.42	0.83
Varieties (V) x Harvesting stages (H)				
V ₁ x H ₁	39.81	17.23	16.41	5.92
V ₁ x H ₂	32.19	25.41	11.20	8.32
V ₁ x H ₃	25.01	22.93	7.73	7.59
V ₁ x H ₄	19.69	19.43	5.86	6.65
V ₂ x H ₁	56.64	22.98	15.58	7.32
V ₂ x H ₂	40.71	36.37	12.73	10.27
V ₂ x H ₃	34.31	30.72	8.27	9.47
V ₂ x H ₄	27.87	28.94	6.79	7.51
V ₃ x H ₁	63.52	26.86	20.07	7.81
V ₃ x H ₂	51.41	46.55	13.13	11.51
V ₃ x H ₃	44.09	40.42	11.40	10.01
V ₃ x H ₄	35.32	33.30	9.60	7.83
Mean	39.22	29.26	11.57	8.36
S. Em +	2.82	2.12	0.84	0.49
C. D. at 5%	NS	NS	NS	NS
CV %	12.44	12.56	12.51	10.12

Conclusion

From the forgoing discussion, it can be concluded that fresh and dry weight of pods recorded in fresh seeds at the time of harvesting were decreased significantly with advance in maturity, while dry weight of seeds and pods were increased up to physiological maturity and then decreased.

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