THE INFLUENCE OF SEED WEIGHT OF SORGHUM BICOLOR (L.) MOENCH ON THE RESULTING CROP

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INTRODUCTION

Differences in seed weights and their possible influence on plant growth and other factors could be important to agriculture. The objective of this research was to determine if the weight of seed planted influenced the growth and development of a sorghum (*Sorghum bicolor* (L.) Moench) crop. Materials from a backcrossing program to develop isogenic single- and twin-seeded lines of Combine Kafir-60 were available for a study of the influence of seed size. Although genetically twin-seeded, the panicles of partially converted twin-seeded Combine Kafir-60 contained both single (one seed per spikelet) and twin (two seeds per spikelet) seed, with the twin seed being noticeably smaller. A comparison of single and twin seed from the same panicle would eliminate genetic differences between seed sizes. Also, since the single and twin seed were randomly dispersed in a panicle, a comparison of single and twin from the same panicle would tend to minimize possible influences of insect and disease damage and other environmental factors on size and quality of seed planted.

REVIEW OF LITERATURE

Using soybeans, buckwheat, lima beans, and corn, Schmidt (20) found that the medium weight seeds produced better plants than did lighter weight seeds or abnormally heavy seeds. However, the light seeds germinated more rapidly than the heavy seeds. He further indicated that seed weights were positively proportional to the dry weight of seedling, leaf area, and grain yield.

Oexeman (16), in his experiment with soybeans (*Soja max* Piper, var. Biloxi and Mandarin), cucumber (*Cucumis sativus* L., var. Early White Spine), and tomato (*Lycopersicon esculentum* Mill., var. Bonny Best), reported that the weights of the seed were positively correlated with dry weights of roots and shoots, growth in stem length, leaf area, number of leaves, number of flowers, and to fruit and grain yield.

Kiesselbach (13), using Turkey red winter, Java spring wheat, and Kherson oats, concluded that seed weights had no positive relation with plant height, maturity, and grain yield. Waldron (27), working with the wheat cross Ceres X (Hope X Florence), found that heavy kernels gave larger yields than light kernels when planted at the same seeding rate. The heads produced per kernel planted were slightly greater for the heavy-kernel seeding.

Kaufmann and McFadden (11,12), working with barley, found that plants from small seeds yielded approximately 77% of those grown from large seeds in the greenhouse and 57% in the field. They also found that plants grown from the large seed appeared much more vigorous, and germination percentage, heading and ripening time, 1000 kernel weight, and number of tillers were positively correlated with seed weights. They concluded that lines grown from a good quality of seed would tend to perform better in competition than those grown from abnormally small or shrunken seed.

Pinthus and Osher (18), working with barley and wheat, reported that seedling emergence percentage, number of mature plants per row, heading date (the day on which 50% of the spikes of main culms had emerged from the sheath of the flag leaf), and kernel weights were not significantly different between large seed and small seed. However, number of tillers per plant, length of main culm, number of kernels per plant, number of spikes per plant, number of kernels per spike, and grain yield were significantly different between large seed and small seed.

McDaniel (14), working with barley, indicated that seedling fresh weight, seedling mitochondrial protein, and mitochondrial biochemical activity were positively correlated with seed weight. The increased quantity of mitochondrial protein of seedlings produced from heavy seeds was indicative of higher respiratory rate and greater amounts of energy (ATP) production. Thus, those seedlings had a greater growth potential than seedlings produced from lighter seeds of the same pure lines.

Erickson (7), working with alfalfa (*Medicago sativa* L.), reported that both germination percentage, vigor of seedlings, and seedling dry weights were directly associated with seed size. Seedling vigor was decreased by increasing the planting depth of small seeds.

Beveridge and Wilsie (3) found that a seeding of selected large seed of alfalfa did not produce a greater number of plants than a normal seeding, but that a more vigorous young seedling growth resulted from the larger seed. They concluded that, even if early advantages were not maintained, stands from large seed would have a better chance of survival under adverse growing conditions or management.

Henson and Tayman (8), working with varieties of birdsfoot trefoil, reported that seed sizes were significantly correlated with dry weights, root weights, and plant heights. They concluded that considering seed size was important in improving the vigor of trefoil seedlings. Stickler and Wassom (22), working with the birdsfoot trefoil varieties Granger, Empire, and Viking, found that increasing seed weight was positively correlated with percentages of emergence and seedling dry weights at various planting depths.

In experiments with birdsfoot trefoil (*Lotus corniculatus* L.), alfalfa (*Medicago sativa* L.), and sainfoin (*Onobrychis viciaefolia* Scop.), Carleton and Cooper (6) found that among- and within-plant differences in seed size may not have the same effect on seedling performance. They also pointed out that differences in seed size within plants were highly correlated with seedling performance.

Moore (15), working with crimson clover (*Trifolium incarnatum*), found that the emergence of seedlings from either the extra large or extremely small crimson clover seeds was reduced to a greater extent by the deeper planting depths than was that from the medium-sized seed. Black (4), working with well rounded seed of subterranean clover (*Trifolium subterraneum*), reported that germination percentage was uniform among the different size groups. He observed also that early growth was proportional to the size of the seed.

Using strains of crested wheatgrass [Standard, *Agropyron desertorum* (Fisch.) Schult., and Fairyway, *A. cristatum* (L.) Gaertn.], Rogler (19) studied emergence of different seed sizes from various planting depths. He found high positive correlations between size of seed and emergence at 2-inch or 3-inch depths of plantings. He concluded that selection for large seed size was a direct method of increasing seedling vigor in crested wheatgrass.

Sung and Delouche (23) indicated that emergence percentage of rice increased with increasing specific gravity of the seed and the greater specific gravity of the seed the greater the length of the radicle or plumule. The total green and dry weight of the seedlings were also increased as specific gravity increased.

Peace (17) obtained significant phenotypic and genotypic correlations between seed weight and seedling vigor for 20 smooth bromegrass (Bromus inermis, Leyss.) strains. He found that when seed size was held constant in covariance analysis, the variance among sources was still significant, indicating that intensive selection for seedling vigor must be concerned with more than just seed weight. Trupp and Carlson (25) indicated that seedling vigor of smooth bromegrass in early stages of growth was highly correlated with seed size; however, the initial vigor advantage of large seeded strains diminished with time. They further indicated that, although the initial advantage decreased with time, the large-seeded strains still were superior to the smaller-seeded strains.

Swanson and Hunter (24) found that seed size did not appear to be a varietal factor in sorghum germination from the standpoint of reserve food supply, as small seeded sorghums showed a tendency to germinate better than large seeded varieties. Microscopic examination of several varieties of sorghum seed showed the starchy mesocarp layer in the seed coat ranged

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from 20 to 50 microns in kafirs and indicated that better stands usually were obtained with the harder seeded varieties having a thin mesocarp.

Bartel and Martin (2) reported a relationship between the size of sorghum seed planted and dry weight per stalk in the early stages of plant development. In young sorghum seedlings, 10 to 12 days after planting, the logarithm of weight per stalk was directly proportional to the logarithm of weight per seed. They concluded that the wider ratio be ween the weight of the seed and the weight of the mature stalk appeared xplain for the most part the smaller seedlings and apparent slower early growth of sorghum under optimum growing condition.

Abdullahi (1) pointed out that the effect of seed size of sorghum on grain yield was not significant, in spite of the superior field establishment of large over small seeds. He pointed out that the mean ave ge of the four seed sizes of grain sorghum showed grain yields which were obviously similar, with the smallest seeds giving 115.3 bushels per acre, while the large, medium, and composite seeds gave 110.3, 113.9 and 112.3 bushels per acre, respectively. Vanderlip (26) pointed out that there seemed to be a poor relationship between seed size and field performance when many sorghum ybrids are compared; however, if seed sizes within a seed lot were con dered, bo extremely large seed and small seed had lower than average establishment capability.

Twin seed is a characteristic of sorghum in which t seeds velop in the spikelet instead of the usual single seed. The ctiona ondition of the lower flower is a single-factor heritable character inant to abortion (9,10). Karper and Stephens (10) reported that the twin-seeded condition in durras was a result of development of the lower flower of the spikelets to a functional stage and the lower flower was a little slower developing than the upper. They further stated that with the exception of the lemma, the parts of the lower flower usually were slightly smaller, and ordinarily the lower flower bloomed from a few hours to a day later than the upper flower.

METHOD AND MATERIALS

The materials used in this study were obtained from a backcrossing program initiated in 1967 to develop isogenic twin-seeded and single-seeded lines of Combine Kafir-60. A twin-seeded line, PI 14610, was used as the source of the twin seeded character. Panicles of genetically twin-seeded plants of Combine Kafir-60 contained both twin-seeded and single-seeded spikelets. The plants from which seed was obtained were from different stages of the backcrossing program, so it was assumed there was considerable genetic variation among the individual plants used as source of seed.

In 1970 and 1971 twin-seeded plants were selfed by placing a kraft paper bag over the panicle before and during anthesis. Fourteen plants were randomly selected from those selfed plants each year as a source of seed for the following year. Twin and single seed from each panicle were separated into individual seed lots, and the 100-kernel weight of each lot was obtained. Shrivelled and damaged kernels were eliminated before weights were taken.

The experimental design was a split-plot randomized complete block with four replications. Source of seed was used as main plot and type of seed as subplot. Individual plots consist of two rows 4.57 m long. Row spacing was 91.44 cm. All rows were planted thick and thinned to give a distance of 15.25 cm between plants.

Measurements obtained are described below:

Emergence percentage. — The number of seedlings 10 days after emergence expressed as the percentage of seed planted in each plot.

Seedling dry weight (g). — Ten seedlings were selected from each plot at intervals of 10, 17, and 24 days after emergence. Those seedlings were selected randomly from every 7.62 cm spacing between the seedlings with the first three seedlings at the ends of the rows being excluded to minimize possible border effect. The seedlings were washed and the roots were eliminated. The seedlings were dried for five days at approximately 38 C before weights were taken. Values for each plot were averaged before being analyzed.

Days to 50% bloom. — The number of days from emergence to the day nearest the time when 50% of the main heads were in some stage of bloom.

Leaf blade characteristics, culm diameter, plant height, and number of nodes per plant. — Ten plants were randomly selected to measure those characters. The first three plants at the ends of the rows were excluded to minimize border effects. The same ten plants were used for all measurements and values for each plot were averaged before being analyzed.

Leaf blade width, length, and area. — The maximum leaf blade width (cm) of the first leaf below flag leaf was obtained regardless of the location on the blade. Leaf blade length (cm) was a measurement from collar to the leaf tip. Leaf blade area (cm^2) was the product of maximum width X length X 0.747 (21).

Culm diameter (cm). — The maximum measurement obtained at the midpoint of the second internode below peduncle by rotating between the jaws of a pair of calipers.

Plant height (cm). — The measurement from the base of the culm to the base of the peduncle.

Number of nodes per plant. — Number of nodes from the base of the culm to the base of the peduncle.

Test weight (kg/hl). — Weight per unit volume of grain. The official test weight apparatus was used.

Kernel weight (g). — Weight of 1000 kernels. Approximately 5 grams of three subsamples were taken randomly per plot. Each subsample was counted by an electronic seed counter and weighed before the results were converted to grams per 1000 kernels.

Number of kernels per panicle. — Computed by dividing the total weight of grain yield per plot by total number of panicles. The resulting quotient was divided by the 1000-kernel weight of the corresponding plot and multiplied by 1000.

Number of panicles per plant. — Computed by dividing the total number of panicles by the number of plants per plot.

Grain yield (kg/plot). — Weight of grain produced per plot. The panicles were harvested by hand and threshed with a nursery thresher. The grain was dried for one week at approximately 40 C before weights were taken.

RESULTS

Table 1 gives a comparison of the 100-seed weights for single and twin seed planted in 1971 and 1972. In all instances of seed from individual panicle, the twin seed weighed less than the single seed. The mean weights of the single and twin were significantly (P = <0.01) different for both years.

The means for emergence percentages; seedling dry weights; days to 50% bloom; leaf blade width, length, and area; culm diameter; plant height; number of nodes per plant; test weight; weight per 1000 kernels; number of kernels per panicle; number of panicles per plant; and grain yield are given in Table 2. All characters measured, except emergence percentage in 1972 and culm diameter in 1971, showed no significant difference between single and twin seed. Differences in measurement between single and twin seed for culm diameter (0.03 cm) in 1971 and emergence percentage (0.6%) in 1972 were significantly different at 5% probability level.

The analyses of variance of emergence percentage, days to 50% bloom, and number of panicles per plant are given in Table 3. The analyses of variance of seedling dry weights measured at 10 days, 17 days, and 24 days after emergence are given in Table 4. The variance due to source of seed was significant for emergence percentage in 1972, days to 50% bloom, number of panicles per plant in 1971 and 1972, and seedling dry weights measured 10 days, 17 days after emergence in 1971. The variance due to type of seed was not significant for those characters except emergence percentage in 1972. The source of seed by type of seed interaction was not significant for those characters.

The analyses of variance of leaf blade width, length, and area are

Table 1. Comparison of 100-seed weights of single and twin seeds of partially converted twin-seeded Combine Kafir-60 planted in 1971 and 1972 at Manhattan, Kansas.

1969 or 1970 row plant number	Weight per 100 seeds (g)		1971 row and plant number	Weight per 100 seeds (g)	
	Single	Twin		Single	Twin
69-3025-1	2.15	1.90	71-3144-1	1.31	1.03
69-3026-13	2.54	2.24	71-3022-1	2.20	2.03
70-3122-1	2.06	1.85	71-3073-1	1.68	1.43
70-3122-2	1.87	1.71	71-3073-2	2.07	1.93
70-3122-3	1.64	1.53	71-3073-3	1.96	1.76
70-3122-4	1.72	1.10	71-3073-4	1.34	1.11
70-3122-6 & 8	1.94	1.74	71-3073-5	1.93	1.60
70-3128-2	2.06	1.87	71-3073-7	2.29	2.01
70-3128-3	2.08	2.00	71-3073-8	1.82	1.62
70-3140-1	1.99	1.69	71-3160-1	1.61	1.34
70-3140-2	1.87	1.59	71-3074-3	1.69	1.48
70-3140-3	2.05	1.71	71-3075-1	1.68	1.27
Composite-1 1/	1.91	1.66	71-3075-2	1.85	1.50
Composite-2 2/	2.40	2.10	71-3144-2	1.94	1.67
Mean 3/	2.02 **	1.76		1.81 **	1.55

1/ Mixture of 69-3026-1, 70-3128-1, and 70-3134-1.
2/ Mixture of 69-3026-4 and 70-3134-1.
3/ ** = Significant at 1% level of probability.

Table 2. Comparison of emergence percentage; seedling dry weights; days to 50% bloom; leaf blade width, length, and area; culm diameter; plant height; number of nodes per plant; test weight; kernel weight; number of kernels per panicle; number of panicles per plant; and grain yield of plants grown from single and twin seed of partially converted twin-seeded Combine Kafir-60 at Manhattan, Kansas, 1971 and 1972.

	1971	1972
Emergence %		
Single	86.6	76.0 *
Twin	88.2	75.4
Seedling dry weight (g)		
10 days after emergence		
Single	0.59	1.15
Twin	0.59	1.03
17 days after emergence		
Single	7.56	5.23
Twin	7.51	5.20
24 days after emergence		
Single	29.1	19.7
Twin	28.8	19.7
Days to 50% bloom		
Single	68.7	63.1
Twin	68.8	63.3
Leaf blade:		
Width (cm)		
Single	6.55	5.85
Twin	6.60	5.86
Length (cm)		
Single	52.27	49.15
Twin	52.93	50.59
Area (cm^2)		
Single	257.3	222.4
Twin	263.0	222.7
Culm diameter (cm)		
Single	1.31 *	1.13
Twin	1.34	1.15
Plant height (cm)		
Single	109.1	101.4
Twin	108.0	100.7

Table 2. Continued.

	1971	1972
No. of nodes/plant		
Single	13.2	10.7
Twin	12.9	10.9
Test weight (kg/hl)		
Single	74.3	72.3
Twin	74.2	72.3
Weight/1000 kernel (g)		
Single	22.5	19.6
Twin	22.4	19.6
No. kernels/panicle		
Single	2,456.0	2,217.0
Twin	2,449.0	2,262.0
No. panicles/plant		
Single	1.22	1.09
Twin	1.21	1.07
Grain yield (kg/plot)		
Single	3.84	2.86
Twin	3.84	2.87

* = Significant at 5% level of probability.

Table 3. Analyses of variance of emergence percentage, days to 50% bloom, number of panicles per plant of plants grown from single and twin seed of partially converted twin-seeded Combine Kafir-60 at Manhattan, Kansas, 1971 and 1972.

		MEAN SQUARE					
		Emergence %		Days to 50% bloom		No. of panicles per plant	
Source	df	1971	1972	1971	1972	1971	1972
Total	111						
Replicates	3	224.66	21.392	4.247	5.535	0.005	18.50
Source of seed	13	72.889	76.891*	16.857**	43.074**	0.143**	21.989*
Error (A)	39	46.92	34.217	1.073	9.574	0.014	10.24
Type of seed	1	71.536	10.321*	0.437	1.750	0.003	14.285
Source x Type	13	19.221	1.269	0.533	1.442	0.018	4.054
Error (B)	42	39.34	2.362	0.931	0.988	0.010	7.19

* and ** indicate significance at 5% and 1% level of probability, respectively.

Table 4. Analyses of variance of seedling dry weights 10, 17, and 24 days after emergence grown from single and twin seed of partially converted twin-seeded Combine Kafir-60 at Manhattan, Kansas, 1971 and 1972.

		MEAN SQUARE					
		Seedling dry weight					
		10 days after emergence		17 days after emergence		24 days after emergence	
Source	df	1971	1972	1971	1972	1971	1972
Total	55 (71) 1/						
Replicates	3 (3)	0.009	0.104	5.793	1.381	3.179	62.875
Source of seed	6 (8)	0.098**	0.125	8.952**	2.126	68.659	84.654
Error (A)	18 (24)	0.014	0.129	1.106	3.681	27.266	38.526
Type of seed	1 (1)	0.001	0.266	0.035	0.021	1.680	0.004
Source x Type	6 (8)	0.014	0.055	0.409	0.102	8.127	0.108
Error (B)	21 (27)	0.016	0.085	0.353	0.128	12.477	0.059

* and ** indicate significance at 5% and 1% level of probability, respectively.

1/ Degree of freedom in parenthesis for 1972 seedling dry weights.

given in Table 5. The analyses of variance of culm diameter, plant height, and number of nodes are given in Table 6. The variance due to source of seed was significant for all characters except leaf blade length measured in 1972 and culm diameter in 1971. The variance due to type of seed was not significant for all characters except culm diameter measured in 1971. The source of seed by type of seed interaction was not significant for those characters except culm diameter measured in 1972.

The analyses of variance of weight per 1000 kernels, number of kernels per panicle, test weight, and grain yield are given in Table 7. The variance due to source of seed was significant for all characters. The variance due to type of seed was not significant for those characters. The source of seed X type of seed interaction was not significant for all characters except test weight measured in 1972.

Table 5. Analyses of variance of leaf blade width, length, and area of second leaf of plants grown from single and twin seed of partially converted twin-seeded Combine Kafir-60 at Manhattan, Kansas, 1971 and 1972.

		MEAN SQUARE					
		Leaf blade width		Leaf blade length		Leaf blade area	
Source	df	1971	1972	1971	1972	1971	1972
Total	63						
Replicates	3	0.114	0.018	27.773	24.892	1410.21	160.74
Source of seed	7	0.303**	0.379*	45.364**	51.616	2406.16**	1226.17*
Error (A)	21	0.047	0.109	4.296	38.123	296.56	350.19
Type of seed	1	0.046	0.001	6.799	33.191	506.083	1.265
Source x Type	7	0.060	0.091	7.103	19.283	471.435	290.319
Error (B)	24	0.064	0.027	4.657	35.537	333.67	126.52

* and ** indicate significance at 5% and 1% level of probability, respectively.

Table 6. Analyses of variance of culm diameter of second internode, plant height, and number of nodes per plant of plants grown from single and twin seed of partially converted twin-seeded Combine Kafir-60 at Manhattan, Kansas, 1971 and 1972.

		MEAN SQUARE					
		Culm diameter		Plant height		No. of nodes per plant	
Source	df	1971	1972	1971	1972	1971	1972
Total	63						
Replicates	3	0.003	0.004	3.948	35.603	0.389	0.473
Source of seed	7	0.002	0.005*	143.696**	105.182**	0.989**	1.229**
Error (A)	21	0.003	0.001	15.907	16.105	0.235	0.295
Type of seed	1	0.016*	0.005	18.457	7.398	1.265	0.765
Source x Type	7	0.001	0.008**	14.582	18.724	0.516	0.301
Error (B)	24	0.002	0.002	9.036	20.97	0.308	0.359

* and ** indicate significance at 5% and 1% level of probability, respectively.

able 7. Analyses of variance of weight per 1000 kernels, number of kernels per panicle, test weight, and grain yield of plants grown from single and twin seed of partially converted twin-seeded Combine Kafir-60 at Manhattan, Kansas, 1971 and 1972.

		MEAN SQUARE							
		Weight per 1000 kernel		No. of kernels per panicle		Test weight		Grain yield	
ource	df	1971	1972	1971	1972	1971	1972	1971	1972
otal	111								
eplicates	3	7.69	0.343	31147.72	49067.91	0.822	1.031	0.137	0.102
ource of seed	13	12.107**	7.773**	829403.88**	326657.33**	2.089**	2.495**	0.345**	0.383**
rror (A)	39	0.822	0.425	71485.63	49654.00	0.556	0.815	0.105	0.057
ype of seed	1	0.006	0.002	1575.00	56655.00	0.805	0.007	0.001	0.002
ource x Type	13	0.785	0.406	10296.82	37981.48	0.457	0.626*	0.050	0.025
rror (B)	42	0.628	0.265	37400.5	36584.57	0.695	0.264	0.071	0.032

and ** indicate significance at 5% and 1% level of probability, respectively.

DISCUSSION AND CONCLUSION

For this study to be more meaningful, precautions were taken to eliminate discrepancies caused by factors other than seed size. Thus, the true effect of seed weight differences on their resulting crop could be estimated. This was explicitly not the case in some of the earlier studies (3,6,7,11, 12,13,16,20,27).

The difference in seed weight of large (single) and small (twin) seed may be explained partially by relationship induced at development stage. The two developing seeds within a spikelet presumably compete for limited nutrients, water supplies, and synthesized metabolites necessary for seed formation and development. This could be the explanation of the significant differences ($P = <0.01$) between large and small seed weight.

The effect of source of seed was significant for most of the characters measured under either one or both environments. This might have been due to genetic or environmental influences, or some combination of both. Since at least possible genetic variations among the sources of seed were expected, the two sizes of seed obtained from individual panicles were kept separate instead of comparing the effect of the two sizes of seed based upon bulking all large or all small seed regardless of seed source. Consequently, a split-plot randomized block design was used to partition the influence of seed source upon size of seed. By using the source of seed as the main plot and type of seed as the subplot, provided more degrees of freedom for testing differences due to seed size, and interaction between source of seed and seed size.

The effect of seed size was significant for emergence percentage in 1972 and culm diameter in 1971. All other characters showed no significant differences. That indicated that the two seed sizes, which had identical genetic constitution and were produced under essentially the same environment had no influence on the performances of plants derived from them. The differences for culm diameter (0.03 cm) in 1971 and emergence percentage (0.6%) in 1972, even though statistically significant, were quite small and should be of little consequences in sorghum production.

The effect of environment on variance due to seed size could not be analyzed since the same sources of seed were not planted under both environments. However, the small relative difference between seed sizes for each character measured would seem to indicate that the performance of each seed size was influenced little by the environments of the two years.

The source of seed by type of seed interaction was significant for culm diameter and test weight in 1972. This indicates that the overall mean differences between large and small seed for each character measured were not uniform for all sources of seed. However, the source of seed by type of seed interactions for the rest of the 14 characters measured were not significant. With regard to the interaction for culm diameter, two sources of seed, 69-3026-13 and 70-3122-4, caused the significance for this character (LSD = 0.066). Within those two sources of seed, the small seed size was consistantly associated with large culm diameter plants. In the interaction for test weight, two sources of seed, 70-3122-6 & 8 and 70-3140-3, were involved in causing the significance for this character (LSD = 0.727). Within these two sources of seed, the effect of neither size of seed was better than the other consistantly. In general, the source of seed by type of seed interaction appeared to be nonexistent, and the effect of size of seed appears independent of the source of seed.

Results indicated that the seed weight classes gave essentially the same performance in the production field. This study implies that growth and development of sorghum plants from large and small seed will not differ significantly when differences are about 14%.

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THE INFLUENCE OF SEED WEIGHT OF *SORGHUM BICOLOR* (L.) MOENCH ON THE RESULTING CROP

by

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The objective of this study was to determine if weight of seed planted influenced the growth and development of a sorghum (Sorghum bicolor (L.) Moench) crop.

The material for the study was obtained from a backcrossing program to develop isogenic twin-seeded and single-seeded lines of Combine Kafir-60. In 1970 and 1971, twin-seeded plants were selfed by bagging. Fourteen heads were randomly selected from those selfed plants each year as a source of seed for the following year. Twin and single seed from each head were separated into individual seed lots. Differences between 100-seed weights of single and twin seed were highly significant ($P = <0.01$), with the twin seed being smaller than the single.

Variation due to type of seed was not significant for seedling dry weights, days to 50% bloom, leaf blade characteristics, plant height, number of nodes per plant, test weight, weight per 1000 kernel, number of kernels per panicle, number of panicles per plant, and grain yield during 1971 and 1972. However, variation due to type of seed for emergence percentage in 1972 and culm diameter in 1971 was significant. From the practical standpoint, the differences of culm diameter (0.03 cm) and emergence percentage (0.6%) might not be meaningful even though statistically significant at 5% level of probability.

The analyses of variance showed that the effect of source of seed was significant for most of characters measured except seedling dry weights measurement 24 days after emergence. The source of seed by type of seed interaction was significant for culm diameter, and test weights in 1972.

All those comparisons indicate that, if large seed is no more than 14% heavier than small seed on the average, the effect of seed weight on plant performance will not be significant.