Effects of sprout number and planting depth on growth and yield of potato

(*SOLANUM TUBEROSUM L*)

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INTRODUCTION

THE plant density of a potato crop is often expressed as the number of plants (sets or hills) per unit area. Although a single seed tuber is planted, it eventually produces a group of competing main stems. Therefore, a more appropriate means to express plant density would be in terms of number of main stems per unit area.

As tuber number per hill is the product of the number of main stems and the number of tubers per main stem, plant density is of abvious significance. When a seed tuber produces several weak sprouts, the sprout length and size can be very uneven. Such weak sprouts may not develop at all, or if they do, the main stems arising from them often do not produce marketable tubers (Bushnell, 1929). After planting, not all sprouts on a seed tuber develop into main stems. A critical sprout length exists and sprouts shorter than the critical length will not develop stems. Beukema, (1973) and Toosey (1963) reported that time taken for emergence and tuberization is shortened considerably as the sprout length at planting is increased upto 1.5 cm, but with relatively little effect with any further increase.

The precise effect of sprout number per set on total yield is dependent on spacing, weight of set and variety. When the crop is harvested at maturity, sprout number has little influence on tuber yield at close spacings, (Toosey, 1962). Higher yields are obtained either by increasing the number of main stems per unit area (Jones, 1946), or when sets with a single sprout are planted, by increasing the supply of substrate thereby improving initial growth rate of foliage, (Svensson, 1960, 1962, Toosey, 1960). The potential yield from a single plant

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which has emerged from a bud at any particular position on a seed tuber is independent of tuber size (Roztropowiez, 1962). Yieldwise, the optimum plant number per hill will depend on number of tubers produced by each individual plant which is significantly influenced by variety, spacing, soil fertility and environment (Burton, 1966).

Under a short growing period as prevelant in Sri Lanka, planting depth may influence rate of sprout emergence. Quicker emergence would be advantageous for providing the crop with an extended period of tuber growth.

An experiment was therefore initiated to ascertain the optimum sprout number per seed tuber, together with planting depth that could contribute towards increased tuber yields by influencing earliness in emergence and tuberization.

MATERIALS AND METHODS

The experiment was conducted at the Agricultural Research Station, Sita Eliya during October, 1973-January, 1974, following a two-year rotation of grass. The soil was well drained and contained 5.3% organic matter, 0.44% available nitrogen ; 112kg/ha P_2O_5 and 0.40 me exchangeable potassium/100 g of soil. The PH was 4.8.

The climatic data are given in Table 1. During the first 65 days after planting (DAP) the crop received sufficient rainfall which was all distributed. From 65 DAP till final harvest a drought prevailed. At 80 DAP, the crop was subjected to frost, but caused negligible damage as the plants were old and senescing.

The treatments consisted of 6 seed types (presprouted seed with sprouts varying from 1-6 per tuber and minichitted seed with 5-6 sprouts per tuber, as a control) planted with either sprouts exposed or buried to a depth of 7.62 cm.

Once multiplied seed of the variety Arka was used. The seed was desprouted 96 days after harvest to remove apical dominance and enhance sprout growth. Subsequently, tubers were stored in wooden trays and exposed to diffused sunlight at a temperature of 20-22°C for 45 days to produce sturdy, dark green sprouts, 1.5cm long. The seeds were minichitted by storing desprouted seed in darkness. The other conditions were indentical to that described for presprouting. This resulted in brittle, yellowish white sprouts, about ½ cm. long.

The seed tubers were graded according to weight, based on their sprout number to compensate for unequal substrate availability for initial sprout growth. Thus a tuber having, 1, 2, 3 or more sprouts weighed 30-46g ; 50-69g ; and 100-132g respectively. Any excess sprouts on a tuber were removed prior to planting.

All plots received 672 kg/ha each of ammonium sulphate (21% N), concentrated super phospate (43% P_2O_5) and 112 kg/ha of muriate of potash (60% K_2O) at planting.

Tamaron and Antracol were sprayed at weekly intervals at 28g/15 litres of water, as a prophylactic measure for insect and disease control.

The treatments were arranged in randomized blocks, replicated 3 times. Each plot measured 3.05 m × 4.88 m (14.9m^2). The plots were thrown into ridges and furrows at a spacing of 61 cm from the centre of one furrow to the other. The tubers were planted at a distance of 25.4 cm in the furrow on 27 October, 1973. Each plot had 8 rows of potatoes, with 12 plants per row, giving a total of 96 plants per plot. Sequential sampling was carried out at 15 day intervals commencing 30 DAP. Sampling was restricted to alternate plants in the centre rows, leaving 2 plants within each row as border plants. Two plants per plot were removed at each harvest for determining tuber number, tuber fresh weight and dry matter yield. Any swollen tip of a stolon was considered a tuber.

At the final harvest tubers were grouped into 3 size grades based on diametre as follows : ware 45-55 mm ; seed 35-45 mm ; and chat, 25-35 mm).

The starch percentage in tubers was also determined at final harvest using a starch balance.

The leaf area was estimated by the disk method (Watson and Watson, 1953). The cross sectional area of the punch was 1.76 cm^2.

RESULTS

Tuber number and size distribution.—Tuber numbers per plant reached a maximum between 45-60 DAP and declined, (Table 2). Tubers with more than one sprout recorded maximum tuber numbers per plant at 45 DAP, while those with a single sprout took 60 days to reach maximum tuber numbers. Highest tuber number per plant was recorded for tubers with 4 sprouts (23.4), and lowest for those with one sprout (15.7).

At 30 DAP, deep planting gave signficantly more tuber numbers per plant compared with shallow planting. However, at 45 and 60 DAP, shallow planting recorded significantly more tubers.

At the final harvest tubers were grouped into 3 size grades based on their diametre, (Table 3). Seed with one sprout recorded significantly more ware size tubers over all other seed types. Planting depths had no significant effect on ware size tubers.

Seed with 4 sprouts gave significantly more seed size tubers per plant (4.27), compared to other seed types. The least number of seed size tubers per plant (2.83) was recorded for tubers with one sprout. Deep planting significantly increased seed size tubers (9%) compared with shallow planting.

Presprouted tubers with 5-6 sprouts per tuber, significantly increased chat size tubers per plant (3.38) compared to all other seed types. The least number of chat tubers per plant was recorded for seed with one sprout (1.75). Maximum chat size tuber production per plant was seen for seed with 5-6 sprouts each and thereafter a decline was recorded with lesser sprout numbers on a seed. Shallow planting significantly increased chat size tubers per plant (23%) compared to deep planting.

Tuber fresh weight yield.—Except for presprouted seed with 4-6 sprouts which recorded maximum tuber fresh weight at 75 DAP all other seed types took 90 DAP, (Table 4). Presprouted seed with 4-6 sprouts significantly outyielded all other seed types at maximum tuber fresh weight. However, seed with one sprout also gave a similar yield at 90 DAP. Presprouted seed with whatever sprout number per tuber, significantly outyielded the minichitted at maximum tuber yields.

At 30, 45 and 90 DAP, deep planting recorded significant increases of 216%, 17.39% and 9.55% respectively in tuber yield compared to shallow planting. Both planting depths reached maximum tuber yields at 90 DAP.

Tuber bulking rate was calculated from 4-15 weeks after planting, using a linear regression equation, y=a + b.t, where y= yield of tubers in kg/ha.; a=a constant; b=bulking rate in kg/ha/week and t+time measured in weeks, (Table 5). Tubers with four sprouts had a higher bulking rate compared with all other seed types. Minichitted seed recorded the lowest tuber bulking rate. Planting depths had no significant effect on tuber bulking rate.

Leaf area index (L).—Minichitted seed and tubers with 5/6 sprouts recorded maximum L at 45 DAP, followed by tubers with 2, 3 or 4 sprouts at 60 DAP and those with one sprout at 75 DAP (Table 6). Highest L was attained by tubers with 2 sprouts (3.65) and the lowest by tubers with one sprout (2.42). Tubers with 4 sprouts maintained L of above 3, except at the initial sampling (2.6) compared to all other seed types.

Both planting depths reached maximum L at 60 DAP, with values of 3.61 and 2.77 for deep and shallow planting respectively. The deep planting recorded more L compared to shallow planting at all harvests.

Total dry matter yield.—All treatments recorded maximum total dry matter at 75 DAP, and tubers with 4 sprouts recorded significantly higher total dry matter yield compared to other treatments (Table 7). At maximum total dry matter, except for presprouted seed with one sprout, all other types of presprouted seed significantly outyielded the minichitted.

Deep planting increased total dry matter yield significantly compared to shallow planting consistently.

Stolon, root and stem dry matter yield.—All treatments reached maximum stolon, root and stem dry matter at 60 DAP, except seed with one sprout which took 75 days (Table 8). Highest stolon, root and stem dry matter was recorded for tubers with 4 sprouts and the lowest for tubers with one sprout.

Both planting depths reached maximum stolon, root and stem dry matter at 60 DAP. Except at 75 DAP, when shallow planting gave significantly greater stolon, root and stem dry matter yield compared to deep planting, at all other harvests deep planting significantly outyielded shallow planting.

Leaf dry matter yield.—Minichitted seed and tubers with 1, 2 and 4 sprouts recorded maximum leaf dry matter yield at 75 DAP, compared to tubers with 3 and 5/6 sprouts which took 60 days (Table 9). Highest leaf dry matter was recorded for presprouted seed with 4 sprouts and the lowest for minichitted seed. Except 45 at DAP when planting depths had no significant effect on leaf dry matter yield, at all other harvests deep plantng significantly outyielded shallow planting in leaf dry matter yields.

Tuber dry matter yield.—All seed types took 90 days to reach maximum tuber dry matter (Table 10). At this harvest, seed with one sprout recorded highest tuber dry matter with an increase of 28 per cent compared with minichitted seed which gave the lowest yield.

,Both planting depths reached maximum tuber dry matter at 90 DAP. At all harvests, deep planting significantly out-yielded shallow planting in tuber dry matter yield and at 30 DAP the increase was over 100 per cent.

Starch percentage in tubers.—No significant differences were recorded in the starch content of tubers for different treatments, except that deep planting increased starch in tubers significantly, compared to shallow planting (Table 11).

DISCUSSION

Presprouting of seed tubers alters the growth pattern of the potato plants either by the seed tuber and sprouts undergoing considerable modifications prior to planting, or in a partial displacement of the vegetative cycle (Toosey, 1963). Presprouting can also result in earlier emergence, tuberization and maturity, often associated with high yields specially under conditions where the growing season to restricted (Beukema, 1973). Confirming the above, presprouting increased rate of crop emergence, leaf area index, tuber yield and total dry matter compared to minichitted, in the present investigations at most samplings. At the initial sampling, seed with 4 sprouts recorded significant increases in tuber yield (819%); leaf area index (114%); tuber number per plant (157%) and total dry matter (95%), when compared to minichitted seed. These results further substantiate the contention of earliness in all growth aspects attributed to presprouting. The additional 15 days taken by seed with one to three sprouts to reach maximum tuber weights compared to seed with over 4 sprouts could be attributed to lesser inter and intra plant competition due to a restricted number of main stems. As all treatments received the same fertilizer application, the total nutrient uptake per plant, specially nitrogen, could have been more at this low plant density, compared to seed with 4-6 sprouts representing higher plant densities. Further with lesser sprouts per tuber, the plants will have the advantage of having more substrate from the mother tuber, thereby enhancing vegetative growth and delaying tuber growth. The data for leaf dry matter support this view, where presprouted seed with one to two sprouts recorded highest leaf dry matter at 75 DAP, compared to 45 days taken by seed with 5-6 sprouts. This was also reflected in tuber numbers per plant. The negligible difference in maximum tuber yields recorded for tubers with either 4 or one sprout support the findings of several authors, (Ivins and Bremner, 1965); (Ivins, 1963. 1967); (Milthorpe and Moorby, 1966); (Dyson 1965); and (Lapwood and Dyson, 1966), who reported that higher nitrogen rates delay tuber formation, but the initial negative effect being offset by the faster rate and longer duration of tuber bulking, resulting in high yields. The tuber yield data for seed with one or four sprouts further support the findings of Toosey (1963) who reported that when harvesting was done at maturity, sprout numbers had little significance on yield at close spacing.

As tubers are borne on stolons arising from main stems the number of main stems and consequently the sprout number per tuber must determine tuber number per plant. The 73% increase in tuber number per plant recorded for seed with 4 sprouts compared to one sprout at maximum tuber yield confirms this assumption. The increase in tuber number per plant in proportion to main stem number, also emphasized the significance of sprout number per tuber.

The high tuber fresh weight yield recorded for deep planting may be due to an initial advantage of its root system growing into the zone of fertilizer application. This could enhance root proliferation, thus increasing nutrient foraging area. Although shallow planting increased tuber number per plant at final harvest (Ivins and Montague, 1958) the positive advantage of a deep and ramifying root system cannot be overemphasized, specially in times of water stress. Thus, shallow planting appeared to have no benefit.

The increase in ware size tubers at lower sprout numbers per seed could be due to few tubers per plant and less inter and intra plant competition. Such a growth pattern may also be responsible for the significant increase in seed and chat size tubers with increasing sprout numbers per seed. Thus, the increase in the number of seed and chat size tubers for presprouted seed with over 4 sprouts was 33% and 48% more than that recorded for tubers with a single sprout.

The decrease in L for seed with 5-6 sprouts from 45 DAP could be the result of competition for nitrogen and mutual shading. This may also have contributed to earlier leaf senescence, compared to plants arising from seed with one sprout. These results are in agreement with the findings of Jones (1946) and Toosey, (1960) who reported that high main stem densities per unit area cause earlier leaf senescence. Although tubers with 4 sprouts maintained L of over 3 from 45 DAP and recorded significantly higher tuber yields at 75 DAP, tubers with one sprout also gave similar yields at 90 DAP, even though L was never over 2.5. This data does not agree with those reported by Radley (1963) and Bremner and Radley (1966) who stated that L of 3 was optimum for tuber production; nor with that of Harper (1963) who suggested an optimum L of 2.6 and 4.3 respectively, for early and later growth stages. Possibly, these differences could be attributed to variations in environmental conditions.

SUMMARY

As plant density in a potato crop is influenced by the number of plants per hill, seed with varying sprout numbers was planted to ascertain the optimum number of main stems per tuber that will give maximum yields. Two planting depths were also incorporated to study any influence of plant emergence that could provide a longer period for tuber growth under short day conditions as prevalent in Sri Lanka.

Presprouted tubers with 4 sprouts recorded a 37% increase in tuber yield two weeks earlier compared to minichitted seed and also gave significantly greater numbers of seed size tubers. It appeared to be the optimum planting material both for consumption and local seed production programmes under short day conditions. Presprouted seed showed quicker emergence compared to minichitted which is a requirement for prolonged tuber growth and high yields

Tuber numbers per plant increased in direct proportion to sprout number per seed.

Leaf area index of below 3 was equally effective as above 3 in producing high tuber yields under a short day regime.

Deep planting of seed tubers appeared to be beneficial compared to planting with sprouts exposed.

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Table 1.—Climatic data, Sita Eliya, 1973–74

Period	Temperature °C Min.	Temperature °C Max.	Soil temperature °C (10.2 cm)	Rainfall mm	Rainfall days	Frost days
October, 1973						
27—31	13.4	19.6	18.0	11.94	5	—
November, 1973						
1—15	12.0	15.2	17.8	3.05	7	—
16—30	11.0	19.0	17.8	10.67	9	—
December, 1973						
1—15	11.0	19.0	17.2	5.84	8	—
16—31	12.0	18.0	16.7	20.57	15	—
January, 1974						
11—5	8.5	19.0	15.8	—	—	6
16—31	9.5	20.0	15.0	—	—	2
February, 1974						
1—15	9.0	20.0	17.2	3.30	3	2

Table 2.—Main effect of treatments on tuber number per plant

Treatments	Days after planting 30	45	60	75	90
(a) Sprout number per tuber					
1 sprout/tuber	6.5	15.5	15.7	10.9	9.0
2 sprouts/tuber	11.4	17.8	17.6	12.4	10.1
3 sprouts/tuber	15.5	18.0	16.5	13.7	9.5
4 sprouts/tuber	20.3	23.4	15.3	15.6	11.0
5—6 sprouts/tuber	18.6	21.8	17.4	14.2	11.0
Minichitted					
5—6 sprouts/tuber	7.9	16.4	15.0	13.3	9.1
L.D.S. (P=0.05)	3.0	4.2	NS	2.2	NS
(b) Planting depths					
Deep planting	18.1	17.2	14.2	12.3	10.3
Shallow planting	8.6	20.1	18.3	13.9	9.6
L.S.D. (P=0.05)	1.7	2.4	1.7	NS	NS
C.V. (%)	18.74	18.83	15.08	14.03	16.49

Table 3.—Main effect of treatments on size grading of tubers at final harvest

Treatments	Ware sizes		Seed sizes		Chat sizes	
	plant	hectare	plant	hectare	plant	hectare
(a) Sprout number per tuber						
1 sprout/tuber	0.30	19,398	2.83	182,370	1.75	113,195
2 sprouts/tuber	0.21	13,448	3.40	219,618	2.30	148,504
3 sprouts/tuber	0.17	10,980	3.70	238,483	2.91	187,691
4 sprouts/tuber	0.20	12,770	4.27	275,731	3.02	194,946
5—6 sprouts per tuber	0.23	14,560	3.75	241,870	3.38	218,167
Minichitted						
5—6 sprouts/tuber	0.15	9,965	3.46	223,004	3.03	195,430
L.S.D P(0=0.5)	0.05	3,676	0.32	20,317	0.31	19,833
(b) Planting depths						
Deep planting	0.19	12,480	3.72	239,933	2.45	158,182
Shallow planting	0.22	14,500	3.41	220,101	3.01	194,479
L.S.D. (P=0.05)	NS	NS	0.18	11,609	0.17	11,126
C.V. (%)	22.9	22.9	7.3	7.3	9.3	9.3

Table 4.—Main effect of treatments on tuber fresh weight yield, t/ha

Treatments	Days after planting				
	30	45	60	75	90
(a) Sprout number per tuber					
1 sprout/tuber	0.363	6.947	12.428	21.578	31.269
2 sorouts/tuber	0.665	10.645	15.246	23.874	26.677
3 sprouts/tuber	1.579	10.588	19.337	25,895	27.033
4 sprouts/tuber	1.296	13.402	16.862	31.570	26.516
5-6 sprouts/tuber	1.545	13.901	17.347	30.341	25.545
Minichitted					
5-6 sprouts/tuber	0.141	7.143	14.421	19.838	22.603
L.S.D. (P=0.05)	0.30	1.171	1.442	4.556	3.266
(b) Planting depths					
Deep planting	1.415	11.273	15.501	26.396	27,809
Shallow planting	0.447	9.603	16.379	24.637	25.384
L.S.D (P=0.05)	0.173	0.676	0.832	NS	1.876
C.V. (%)	26.95	9.37	7.55	14.93	10.21

Table 5.—Main effect of treatments on tuber bulking rate

Treatments	*Tuber bulking rate, Kg/ha/week*	*r*
(*a*) *Sprout number per tuber*		
1 sprout/tuber	3,592	0.9931
2 sprouts/tuber	3,067	0.9851
3 sprouts/tuber	3,112	0.9720
4 sprouts/tuber	3,224	0.9184
5–6 sprouts/tuber	4,396	0.9767
Minichitted 5–6 sprouts/tuber	4,186	0.9790
(*b*) *Planting depths*		
Deep planting	3,051	0.9751
Shallow planting	3,192	0.9785

Table 6.—Main effect of treatments on leaf area index

Treatments	*Days after planting*			
	30	45	60	75
(*a*) *Sprout number per tuber*				
1 sprout/tuber	1.15	1.98	2.32	2.42
2 sprouts/tuber	1.68	2.67	3.65	2.49
3 sprouts/tuber	1.82	2.87	3.26	2.38
4 sprouts/tuber	2.61	3.23	3.47	3.34
5–6 sprouts/tuber	1.96	3.42	3.21	2.64
Minichitted 5–6 sprouts/tuber	1.22	3.02	2.23	2.20
L.S.D. (P=0.05)	0.21	0.22	0.25	0.33
(*b*) *Planting depths*				
Deep planting	2.10	3.13	3.61	2.70
Shallow planting	1.38	2.60	2.77	2.46
L.S.D. (P=0.05)	0.12	0.31	0.15	0.19
C.V. (%)	10.81	6.31	6.58	10.58

Table 7.—Main effect of treatments on total dry matter yield, Kg/ha

Treatments	Days after planting			
	30	45	60	75
(a) Sprout number per tuber				
1 sprout/tuber	514.38	1347.50	3275.53	5183.37
2 sprouts/tuber	700.25	1639.13	4009.00	5719.38
3 sprouts/tuber	1103.45	1678.77	4868.62	6297.65
4 sprouts/tuber	1166.93	1757.27	4585.60	7758.80
5–6 sprouts/tuber	1059.68	1756.48	4747.65	7309.55
Minichitted 5–6 sprouts/tuber	544.67	1589.73	4037.58	5096.18
L.S.D. (P=0.05)	112.69	129.46	197.54	163.45
(b) Planting depths				
Deep planting	1038.68	1699.83	4465.33	6430.76
Shallow planting	661.04	1556.46	4024.27	6025.29
L.S.D. (P=0.05)	65.06	96.36	114.05	94.37
C.V. (%)	11.07	6.64	3.88	2.19

Table 8.—Main effect of treatments on dry matter yield in stolon, root and stem, Kg/ha

Treatments	Days after planting			
	30	45	60	75
(a) Sprout number per tuber				
1 sprout/tuber	139.76	216.21	420.21	445.21
2 sprouts/tuber	270.74	320.50	453.72	395.27
3 sorouts/tuber	431.10	435.10	501.48	353.48
4 sprouts/tuber	445.10	456.30	670.96	423.10
5-6 sprouts/tuber	418.83	445.83	572.44	405.44
Minichitted 5-6 sprouts per tuber	190.09	301.48	480.93	380.39
L.S.D. (P=0.05)	59.38	48.41	78.45	45.18
(b) Planting depths				
Deep planting	396.89	421.46	580.22	265.91
Shallow planting	260.12	349.45	435.65	330.16
L.S.D. (P=0.05)	86.38	39.75	69.54	26.46
C.V. (%)	12.41	8.26	7.56	8.41

Table 9.—Main effect of treatments on leaf dry matter yield, Kg/ha

Treatments	*Days after planting*			
	30	45	60	75
(*a*) *Sprout number per tuber*				
1 sprout/tuber	376.62	390.51	635.00	658.96
2 sprouts/tuber	410.24	502.85	690.21	704.21
3 sprouts/tuber	596.31	620.31	684.78	555.78
4 sprouts/tuber	670.57	750.33	841.30	845.46
5-6 sprouts/tuber	590.57	694.11	732.54	698.54
Minichitted				
5-6 sprouts per tuber	362.71	390.80	620.25	655.09
L.S.D. (P=0.05)	89.06	116.82	94.62	109.82
(*b*) *Planting depths*				
Deep planting	570.07	667.40	840.64	735.34
Shallow planting	391.76	647.89	655.74	537.74
L.S.D. (P=0.05)	121.27	NS	102.46	141.46
C.V. (%)	8.04	7.56	6.64	5.61

Table 10.—Main effect of treatments on tuber dry matter yield, Kg/ha

Treatments	*Days after planting*				
	30	45	60	75	90
(*a*) *Sprout number per tuber*					
1 sprout/tuber	5.34	740.24	2217.16	4080.11	6892.65
2 sprouts/tuber	15.00	824.31	2865.31	4620.40	5434.05
3 sprouts/tuber	60.43	623.00	3681.95	5389.12	5872.90
4 sprouts/tuber	50.25	551.77	3074.11	6490.55	6468.01
5-6 sprouts/tuber	58.74	617.46	3443.87	6206.52	5980.91
Minichitted					
5-6 sprouts per tuber	0.91	898.73	2937.69	4061.39	5380.78
L.S.D. (P=0.05)	36.21	121.26	226.31	134.89	244.61
(*b*) *Planting depths*					
Deep planting	70.66	611.66	3045.92	5430.84	5968.63
Shallow planting	7.44	560.46	2934.41	5158.79	5694.61
L.S.D. (P=0.05)	41.32	39.11	49.52	92.34	116.17
C.V. (%)	23.92	6.48	5.54	6.29	5.49

Table 11.—Main effect of treatments on starch percentage in tubers at final harvest

Treatments	Starch percentage in tubers
(*a*) *Sprout number per tuber*	
1 sprout/tuber	15.67
2 sprouts/tuber	15.54
3 sprouts/tuber	15.79
4 sprouts/tuber	15.67
5–6 sprouts/tuber	15.83
Minichitted	
5–6 sprouts/tuber	16.33
L.S.D. (P=0.05)	NS
(*b*) *Planting depths*	
Deep planting	16.04
Shallow planting	15.57
L.S.D. (P=0.05)	0.46
C.V. (%)	4.19