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A comparison of the growth habit and production of rogue and normal tomato plants.

by

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This study was executed during a one year stay at the Institute of Horticultural Engineering at Wageningen Holland. For this research co-workers and equipment of the Institute were placed at my disposal.

Introduction.

Many varieties of tomato tend to produce some plants which show abnormalities and these are variously known as rogues. They differ from normal plants by having very short internodes and smaller leaves with fewer segments. The tendency for side-shoots to develop early gives a feathery appearance and, most important of all, the first truss gives sterile flowers and later trusses yield only a few small fruits.

Summary of the literature.

It was found that temperatures during the time from sowing until the cotyledons open out affected the number of rogues produced. The lower the day and night germination temperature, the lower the percentage of rogues (Anonymous, Tomatoes Bull, 77, page 21). Effects of temperature on the production of rogue plants in the variety Ailsa Craig are demonstrated in table 1.

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Table 1. Effect of temperature on the production of rogue plants in the variety Ailsa Craig. The seedlings were kept at the controlled temperatures until the cotyledons had expanded.
The day period was 14 hours and the night 10 hours (from Calvert 1955).

Treatment	temperature		Rogues
	day	night	(per cent.)
1	26 ° C	26 ° C	12,9
2	26 ° C	12,5° C	7,6
3	12,5 ° C	26 ° C	8,0
4	12,5 ° C	12,5° C	1,7

The effect of the day length and light intensity on the production of rogue plants is shown in table 2 (A. Calvert 1955).

Table 2. Showing the effect on rogue production of reduced day-length and light intensity.
Variety: Ailsa Craig.
Temperature: 30° C seed sown: 11th June - treatments continued to:19th June (from Calvert 1955).

Day length	Light intensity	Number of plants	Rogues
16 hours	normal	91	6,6 percent
7 hours	normal	185	15,6 percent
16 hours	half normal	93	12,9 percent
7 hours	half normal	170	11,7 percent

The rogue plants have less production than normal ones. Therefore it is important to know the rogue plants in an early stage and discard them. When the plants have five or six leaves, recognition is easy but, at that stage, labour and space have been wasted on the care of worthless plants. With practice recognition is possible when the first true leaf appears. At this stage a normal seedling has one well-developed leaf with a large terminal lobe and two or three very small segments near the stalk. A rogue of the same age will have two equally developed leaves each with three lobes about equal in size. (Anonymous Tomatoes Bull. 77). On the other hand, as a general rule, rogue seedlings begin to produce their first two pairs of rough or true leaves more quickly than normal plants, and when 7 - 10 days old they can be recognized by the somewhat crossshaped formation of these two pairs of leaves. After a fortnight or so rogues cannot be mistaken even by the inexperienced eye since they are more dwarf and more "bunchy" in growth than the surrounding seedlings (Allerton, 1957).

Materials.

An experiment was set up to study differences between normal and rogue plants. Twelve normal and twelve rogue plants were chosen from the variety Craigress. This is a rather new variety (Ailsa Craig green back type), which produced a very high % rogues in the Netherlands this season. The seedlings were planted in the southern part of the greenhouse, in an outside row running from east to west.

Methods.

All of the experimental plants were given the same treatment. The seeds were sown in flat boxes on the 14th of November, and germinated by the 20th of November. On the 22th of November, they were first transplanted into soil blocks, on the 13th of December they were again transplanted into plastic pots. On the 11th of Januari they were planted out at distances of 80 x 45 cm.

Results of the experiment.

The growth and the culture treatments were recorded daily. Weekly observations were also made on the development of flowers and fruits on each plant. The results demonstrate that normal plants are more fertile than rogues, but that the rogue plants have greater vegetative growth than the normal plants.

On the 15th of February the leaves below the first productive trusses were counted. This is shown in table 1. On the rogue plants the first, second and sometimes third trusses were not developed. From the third or fourth truss the rogue plants became fertile.

Table 1. Number of leaves below the first truss with fruits.

Plant no.	1	2	3	4	5	6	7	8	9	10	11	12	mean
Normal pl.	11	12	11	11	11	11	10	10	10	10	11	10	10,6
Rogue pl.	22	19	17	21	18	15	18	17	17	19	16	16	17,9

It can be seen that the rogue plants produced leaf numbers varying from 16 to 22 while the normal plants varied between 10 and 12 leaves. Moreover the numbers of side shoots of the normal and rogue plants until the 17th of April show that the rogue plants have much more side shoots than the normal ones (table 2).

Table 2. Number of side shoots on the 17th of April.

Plant no.	1	2	3	4	5	6	7	8	9	10	11	12	mean
Normal pl.	25	22	19	22	28	24	19	23	21	29	24	25	23,4
Rogue pl.	42	35	38	38	34	38	31	39	41	37	41	33	37,2

When the plants reach the overhead wires, their tops were cut, and the dates recorded (table 3).

Table 3. Dates on which the tops of the plants reached the supporting wires.

Plant no.	1	2	3	4	5	6	7	8	9	10	11	12
Normal pl.	4.IV	4.IV	4.IV	3.IV	4.IV	3.IV	4.IV	4.IV	4.IV	4.IV	4.IV	4.IV
Rogue pl.	4.IV	4.IV	5.IV	9.IV	9.IV	4.IV	9.IV	9.IV	9.IV	9.IV	9.IV	4.IV

Another difference which has been observed when the plants had grown is that the leaves of the rogues are abnormally dark in colour, and while the leaves of the normal plants are arranged alternately, those of the rogues are mostly abnormal in that way that they have an irregular arrangement.
Furthermore, the higher trusses from the 4^{th} trusses of the rogue plants were more branchy.
As a result of the branching of the higher trusses on the rogue plants, they have more flowers than the normal plants later on.
As for flowering, fruit-setting and fruit-ripening, however, the normal plants are earlier than the rogues (table 4, 5, 6).

Table 4. The dates of the first flowering.

plant no.	1	2	3	4	5	6	7	8	9	10	11	12
Normal pl.	24.II	27.II	27.II	24.II	24.II	22.II	20.II	27.II	20.II	24.II	22.II	27.II
Rogue pl.	28.II	27.II	27.II	27.II	27.II	27.II	24.II	27.II	27.II	27.II	24.II	27.II

Table 5. The dates of the first fruit setting (fruit diameter 1 cm).

Plant no.	1	2	3	4	5	6	7	8	9	10	11	12
Normal pl.	6.III	28. II	7.III	6.III	6.III	6.III	28. II	6.III	3.III	3.III	2.III	6.III
Rogue pl.	7.III	6.III	6.III	6.III	6.III	6.III	6.III	6.III	6.III	7.III	7.III	7.III

Table 6. The dates of the first fruit ripening.

Plant no.	1	2	3	4	5	6	7	8	9	10	11	12
Normal pl.	28.IV	28.IV	28.IV	24.IV	24.IV	28.IV	24.IV	24.IV	24.IV	28.IV	24.IV	28.IV
Rogue pl.	2. V	28.IV	28.IV	28.IV	2. V	2. V	28.IV	28.IV	2. V	2. V	28.IV	28.IV

Despite the excessive flowering of the rogues the percentage of fruit-setting as well as fruit quality was lower. Monthly totals of the number of flowers, set fruits, and ripe fruits are shown in table 7, 8, 9.

Table 7. Monthly totals of the number of flowers.

Plant no.		1	2	3	4	5	6	7	8	9	10	11	12	mean
February	N	8	7	11	9	7	8	7	7	9	10	10	10	8,5
	R	1	2	7	-	3	4	-	4	2	3	6	6	3,8
March	N	44	41	50	46	41	46	49	38	39	38	45	44	43,4
	R	38	42	50	-	51	51	-	47	58	39	63	44	48,3
April	N	14	20	45	22	41	20	28	27	21	21	18	18	24,6
	R	54	41	59	-	25	49	-	36	36	45	85	21	45,1
May	N	-	-	-	-	2	-	-	1	-	-	-	-	-
	R	-	-	-	-	1	-	-	-	-	1	-	-	-

Table 8. Monthly totals of the number of well set fruits.

Plant no.		1	2	3	4	5	6	7	8	9	10	11	12	mean
February	N	-	1	-	-	-	-	1	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-	-	-	-	-
March	N	37	36	33	38	38	39	29	36	36	31	43	34	35,8
	R	20	27	40	-	36	31	-	36	33	26	41	33	32,3
April	N	16	19	32	14	18	17	24	24	8	14	21	29	19,7
	R	36	31	32	-	17	33	-	17	15	23	41	22	26,7
May	N	7	2	31	15	23	8	9	16	14	7	6	1	11,6
	R	18	10	4	-	17	4	-	5	23	10	9	0	10,0

Table 9. Monthly totals of the number of ripe fruits.

Plant no.		1	2	3	4	5	6	7	8	9	10	11	12	mean
April	N	2	4	1	5	3	2	2	2	6	2	7	3	3,2
	R	0	1	3	-	0	0	-	1	0	0	4	2	1,1
May	N	40	37	51	36	33	39	33	42	34	37	35	42	38,2
	R	29	28	57	-	40	31	-	34	33	28	35	37	35,2
June	N	16	15	37	24	25	14	17	16	11	10	17	11	17,7
	R	24	24	28	-	21	24	-	14	25	25	38	15	23,8

Totals of the number of flowers and well set fruits on each truss of the rogue and normal plants are shown in table 10, 11, 12, 13.

Table 10. Totals of the number of flowers on each truss of the normal plants.

plant no.	trusses						
	1	2	3	4	5	6	7
1	9	11	11	12	12	11	-
2	10	10	11	13	12	12	-
3	9	11	16	14	25	18	13
4	9	10	13	13	9	11	12
5	7	9	12	12	12	12	27
6	11	12	13	12	13	13	-
7	9	11	11	14	14	14	-
8	13	10	12	13	12	12	12
9	11	12	11	12	12	11	-
10	11	10	12	11	12	4	-
11	5	10	11	13	12	11	11
12	9	11	13	13	13	13	-

Table 11. Totals of the number of well set fruits on each truss of the normal plants.

plant no.	trusses						
	1	2	3	4	5	6	7
1	6	11	11	11	10	11	-
2	10	10	11	11	10	6	-
3	9	11	13	12	21	17	13
4	7	9	11	10	8	11	11
5	5	9	11	10	11	9	24
6	9	11	11	11	10	11	-
7	6	11	10	12	12	12	-
8	10	9	11	12	11	11	12
9	10	10	10	10	9	9	-
10	10	10	11	10	11	-	-
11	4	10	11	13	11	10	11
12	5	11	13	12	13	10	-

Table 12. Totals of the number of flowers on each truss of the rogue plants.

plant no.	trusses										
	1	2	3	4	5	6	7	8	9	10	11
1	0	0	8	12	9	9	23	16	16	0	0
2	0	0	8	9	9	15	21	9	14	0	0
3	0	11	8	14	9	10	22	26	16	0	0
4	-	-	-	-	-	-	-	-	-	-	-
5	0	0	8	8	8	23	9	11	13	0	0
6	0	0	6	8	23	24	25	18	0	0	0
7	-	-	-	-	-	-	-	-	-	-	-
8	0	0	6	13	8	13	8	21	8	8	2
9	0	0	-	7	19	13	21	13	10	13	0
10	0	0	7	8	9	16	24	8	16	0	0
11	0	4	8	9	23	9	11	19	37	27	7
12	0	12	7	8	16	7	13	8			

Table 13. Totals of the number of well set fruits on each truss of the rogue plants.

plant no.	trusses										
	1	2	3	4	5	6	7	8	9	10	11
1	0	0	8	10	7	9	17	9	14	0	0
2	0	0	8	9	9	15	13	5	9	0	0
3	0	9	8	13	9	9	18	7	3	0	0
4	-	-	-	-	-	-	-	-	-	-	-
5	0	0	8	8	8	23	8	5	10	0	0
6	0	0	5	8	18	15	16	6	0	0	0
7	-	-	-	-	-	-	-	-	-	-	-
8	0	0	4	13	8	12	6	10	1	5	1
9	0	0		7	16	11	14	5	7	11	0
10	0	0	7	8	9	15	6	6	8	0	0
11	0	0	8	9	21	9	10	13	14	5	2
12	0	12	6	8	12	7	7	3	0	0	0

As a result normal plants are more productive than the rogue plants, and their fruit quality is much better (table 14).

Table 14. Monthly totals of number and weight (in grams) of harvested fruits per normal plant.

plant no.		1	2	3	4	5	6	7	8	9	10	11	12	Total
April	gram	150	265	125	335	190	140	170	150	485	105	450	265	2830
	number	2	4	1	5	3	2	2	2	6	2	7	3	39
May	gram	3360	2930	3605	2500	2630	3515	2670	2990	2650	3330	2375	3605	36160
	number	40	37	51	36	33	39	33	42	34	37	35	42	459
June	gram	1215	1110	1580	1325	1920	775	1565	1025	590	640	1320	670	14035
	number	16	15	37	24	25	14	17	16	11	10	17	11	213
Total	gram	4725	4305	5310	4160	4740	4430	4405	4165	3725	4075	4145	4840	53025
	number	58	56	89	65	61	55	52	60	51	49	59	56	711

Table 15. Monthly totals of number and weight (in grams) of harvested fruits per rogue plant.

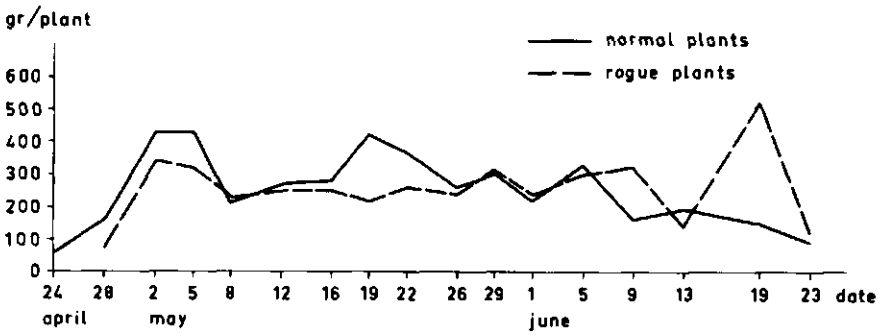
plant no.		1	2	3	4[x]	5	6	7[x]	8	9	10	11		
April	gram	0	85	240	-	0	0	-	55	0	0	245	145	770
	number	0	1	3	-	0	0	-	1	0	0	4	2	11
May	gram	2320	2280	2785	-	3175	2370	-	2235	2500	2185	2325	2540	24715
	number	29	30	44	-	40	31	-	34	33	28	35	37	341
June	gram	1605	2080	1885	-	1525	1670	-	1020	1635	1910	2365	1005	16700
	number	24	24	28	-	21	24	-	14	25	25	38	15	238
Total	gram	3925	4445	4910	-	4700	4040	-	3310	4135	4095	4935	3690	42185
	number	53	55	75	-	61	55	-	49	58	53	77	54	590

[x]These plants are not harvested because they were lost.

Mean yield per plant for each harvest is shown in graph. 1.

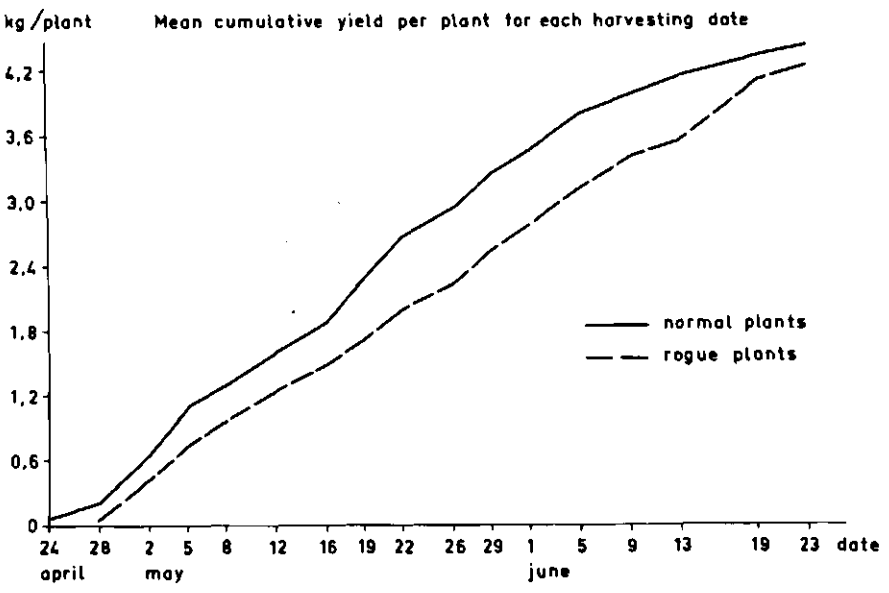
Mean cumulative yield per plant for each harvesting date is shown in graph. 2.

Mean yield per plant for each harvesting date



67.198.

Graph. 1



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Graph. 2

Monthly mean of first and second quality yield in grams of normal and rogue plants are shown in table 16.

Table 16. Monthly mean of first and second quality yield in grams per normal and rogue plant.

Months	normal plants(in grams)		rogue plant(in grams)	
	first quality	second quality	first quality	second quality
April	235,83		77,00	
May	2367,00	646,25	2045,00	426,00
June	572,50	597,00	600,00	1070,00
Total	3175,33	1243,25	2722,00	1496,00
Percent.	71,9 %	28,1 %	64,5 %	33,5 %

Discussion:

As it is seen on the tables above, there are rather big differences in earliness, quality and productivity between rogues and normal plants. Normal plants are earlier than rogues about 3 - 4 days, therefore they have 400 gr more production per plant than the others in the first two months. Early in the season when prices are high, it is possible to get more proceeds from normal ones. During the same period, normal plants have 480,83 gr per plant more first quality production. This number can be very important for a large culture.
On the other hand, in Turkey, it is possible to buy fresh tomatoes from outside culture between May and January. After this season of heavy production there is a great shortage, which makes prices very high. Therefore it would be very profitable for a grower, to obtain a good yield in this period.

However, in this time tomatoes must be raised in the greenhouse, and it is the high cost of building that makes it necessary for the grower to get good returns. So it is important to discard rogues in the culture of tomatoes.

Reference.

1. Allerton F.W. - Tomato Growing - Faber and Faber Limited 24 Russell Square London 1957.

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3. Anonymous - Tomatoes - Ministry of Agriculture, Fisheries and Food - 1962 - Bulletin no. 77.

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