TITLE OF PROJECT: Cultural Management of Garlic - 2004.

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METHODS: Plots were established on a Brookston clay loam sand spot phase soil (10% O.M; pH = 7.8) unless otherwise stated, on the Ridgetown College research farm. Plots were hand seeded on 5 November (nitrogen, irrigation) and 7 November (scape removal, BTM) 2003. The seed (Music strain) was placed in a trench 15 cm deep, so that the top of the clove was approximately 12.5 cm from the soil surface. Rows were spaced 65 cm apart, and the seed was placed at 10 cm spacings in the row.

Weeds were controlled with an application of Roundup Transorb (360 g/l) @ 1.0 liters/ha on 21 November, 2003, and Devrinol DF (50DF) @ 4.0 kg/ha on 6 April, 2004. Weed escapes were controlled by hand hoeing. Nitrogen (as ammonium nitrate) was applied at a rate of 35 kg/ha on 6 April and again on 19 April.

Emergence counts were done as soon as the garlic emerged in the spring. Scapes were removed as they appeared, beginning on 11 June. The garlic was harvested on 20 July, topped and placed in a shaded greenhouse to cure. Tops were dried and weighed where applicable, and bulbs were counted and weighed.

TREATMENTS: Four cultural treatments were evaluated, as outlined below.

1. Biological Trigger Mechanism.

This product is a complete collection of harmless soil bacteria in suspension. Product literature indicates that introducing these beneficial organisms to the soil or water improves the microbial balance, and increases yield through improved bioavailability of plant nutrients. In this experiment, garlic seed without BTM will be compared to garlic seed with BTM as a preplant dip on the seed.

2.Timing of scape removal.

It has been well documented that if scapes are left on the garlic plant, yields (bulb sizes) are reduced. Previously we have studied this in an attempt to determine at what point the scape must be removed before it negatively affects yield. In these studies, scape removal was based on the length of scape; however, the results over years were variable and conclusions were difficult to make.

In 2002, 2003 and again in 2004 we will address this problem by removing scapes every 3-4 days, and documenting the development stage of the plant at each removal time (plant fresh weight, dry weight, total scape length, scape dry weight, bulb diameter) with the intent of determining the optimum stage of growth for scape removal.

3.Nitrogen timings and rates.

The effect of nitrogen rates and timings on garlic yields were evaluated for a third year. This trial was established on a fine sandy loam soil (75.8 % sand, 18.0 % silt, and 6.3 % clay respectively; 2.3 % organic matter). The treatments are outlined in the following table (treatment #3 is the OMAF recommended rate and timing):

	NITROGEN RATE (ACTUAL KG/HA)			
	Application Date			
TREATMENT	6 April	19 April	3 May	Total N
1	0	0	0	0
2	27.5	13.8	13.8	55
3	**55**	**27.5**	**27.5**	**110**
4	82.5	41.25	41.25	165
5	110	0	0	110
6	55	55	0	110
7	55	0	55	110

4.Timing of irrigation.

Critical irrigation timings are available for may crops, and often coincide with the onset of flowering or expansion of the edible portion of the crop. Because of their relatively small root systems, ***alliums*** in general are reported to benefit from irrigation at all periods in their life cycle. Developing scapes in hardneck garlic competes strongly with bulbs for metabolites, as is seen by depressed bulb sizes on non-scaped plants. The onset of scape development may be a critical irrigation point for hard neck garlic. In this trial we hope to observe the benefit of irrigating at different growth stages of garlic. This project will compare the yield of garlic which is not irrigated to garlic which has water applied in early spring, applied when the scape appears, and applied after the scape is removed.

EXPERIMENTAL DESIGN AND DATA ANALYSIS: The experiments were established as a randomized complete block design with 6 replications. A single plot consists of 1 row, 5.0 m in length.

The data was statistically analysed using analysis of variance for a randomized complete block design. A protected LSD was used to separate the treatments with significant differences . Means followed by the same letter within a column do not significantly differ (P=.05, LSD).

RESULTS:

1.Biological Trigger Mechanism

While garlic treated with BTM generally had larger bulbs and increased yields, the differences were not statistically significant (Table 1).

2.Timing of scape removal.

Similar to 2003, we removed scapes every 3-4 days with the 2004 crop, and compared plant development parameters as well as bulb weights and total yields. The first removal date (7 June) was made soon after the scapes appeared, when the average visible length was 6.1 cm (2.4 inches). A significant drop in bulb weight and yield was first noted if the scapes were left on 9 days after they were first detected (16 June) and the trend continued through to harvest (Table 2; Figure 1).

3.Nitrogen timing and rates.

Although statistically differences were not noted, bulb sizes and yields tended to be greatest when nitrogen was applied at the recommended OMAF rate in 2 splits; one when the garlic emerges and the other in early May. The benefit of this late application may reflect the wet spring we had in 2004. All treatments tended to increase bulb sizes and yield when compared to plots with no applied nitrogen. Visually, untreated plots were apparent. (Table 3).

4.Timing of Irrigation.

Irrigation timing was scheduled using TDR soil moisture recording instruments. Given the plentiful rainfall through the spring of 2004, irrigation was not required until early July, well past the period of scape removal (Table 4). No significant differences were noted between any treatments.

Table 1. Effect of Biological Trigger Mechanism on the yield of Garlic. Ridgetown College, 2004

Treatment	Average Bulb Weight (g)	Yield (t/ha)	Yield (t/ha) adjusted
Biological Trigger Mechanism	66.1	9.3	10.2
Control	61.9	8	9.5
p-value	0.4947	0.2455	0.491
LSD(.05)	N.S.	N.S.	N.S.
CV	15.5	19.8	15.4

Table 2. Effect of timing of scape removal on the yield of garlic. Ridgetown College,

2004

Treatment	Average Bulb Weight (g)	Yield (t/ha)	Yield (t/ha) adjusted
June 7	47.3 a	6.6 a	7.7 a
June 10	44.2 a	6.6 a	7.6 ab
June 16	38.5 b	5.9 ab	6.6 bc
June 20	38.8 b	5.8 ab	6.6 bc
June 24	33.1 bc	5.0 bcd	5.6 cd
June 30	37.3 bc	5.2 bc	6.1 cd
July 5	35.6 bc	5.4 bc	6.1 cd
July 12	34.4 bc	4.7 cd	6.1 cd
July 20	32.2 c	4.2 d	5.0 d
p-value	0.0001	0.0001	0.0001
LSD(.05)	5.29	0.89	1.06
CV	11.96	13.92	14.27

Figure 1: Bulb weight in response to scape removal length and time

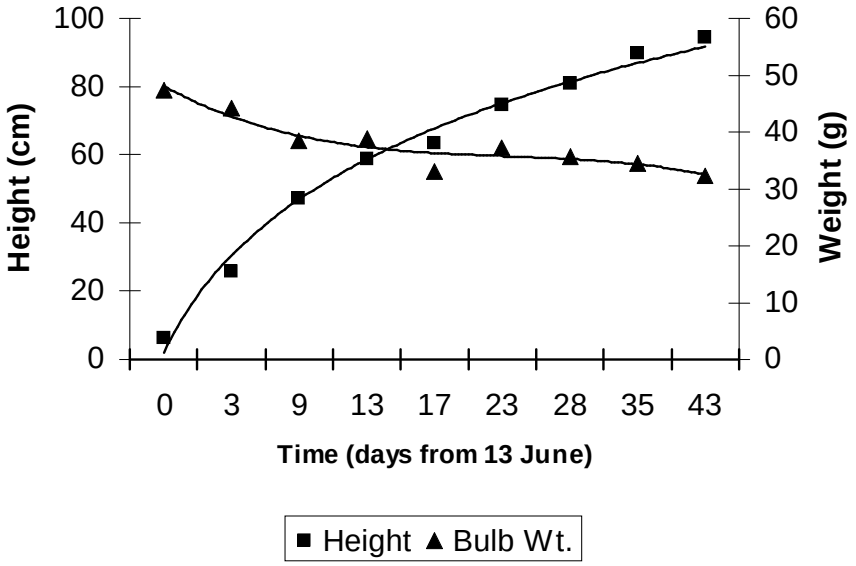

Table 3: Effect of nitrogen application rate and timing on the yield of garlic. Ridgetown College, 2004

Nitrogen Rate and Timing		Average Bulb Weight (g)	Yield (t/ha)	Adjusted Yield (t/ha)
1.	0.0 kg	44.3	5.8	7.5
2.	27.5 kg; 13.8 kg, 13.8 kg	53.1	6.9	9.0
3.	**55 kg; 27.5 kg; 27.5 kg**	51.3	6.6	8.7
4.	82.5 kg; 41.2 kg; 41.2 kg	51.7	7.1	8.8
5.	110.0 kg, 0.0 kg; 0.0 kg	49.1	6.5	8.3
6.	55.0 kg; 55.0 kg; 0 kg	47.2	6.7	8
7.	55.0 kg; 0.0 kg; 55.0 kg	55.6	7.6	9.4
p-value		0.4222	0.4622	0.4222
LSD(.05)		N.S.	N.S.	N.S.
CV		18.14	20.91	18.14

Table 4. Effect of timing of irrigation on the yield of garlic. Ridgetown College,2004

Treatment	Average Bulb Weight (g)	Yield (t/ha)	Yield (t/ha) adjusted
No irrigation	49.7	7.6	7.6
Irrigation, early spring	49.2	7.5	7.6
Irrigation, scape appears	51.1	7.1	7.9
Irrigation, scape removed	53.7	8.0	8.3
p-value	0.8103	0.758	0.8106
LSD(.05)	N.S.	N.S.	N.S.
CV	17.16	17.76	17.15