However, there are other potential uses to which guar could be put; first, as a protein supplement for cows. In this connexion the conclusions arrived at by Boyd *et al.*[8], from the analysis of nearly 500 samples of Sudan grass, are relevant (Table 1).

Table 1

mg HCN/100 g dry tissue	Toxicity
0–25	Very low (safe pasture)
25–50	Low (safe pasture)
50–75	Medium (doubtful)
75–100	High (dangerous pasture)
> 100	Very high (very dangerous pasture)

In comparison, HCN content of guar (55 mg/100 g) may therefore be regarded as being medium. However, guar could be quite safe in pasture if it were grazed at a mature stage, since the content of HCN is then negligible.

The 'apparent yield' of guar from the preliminary experiment exceeded that of any other native beans that have been planted on the University Farm. Analyses of guar beans and native cowpea seeds (*Vigna unguiculata* [illegible] comparison.

[illegible] Constituents of Guar Beans [illegible] Cowpea

	Moisture	Ash	Protein	Crude fibre	Nitrogen-free extractives	Fat
Cowpea seeds	8·70	3·78	22·75	1·81	67·28	2·46
Guar beans	6·9	3·4	25·0	10·0	52·1	2·6

It is obvious from Table 2 that the protein content of guar beans exceeds that of cowpeas and hence guar beans could be used as a source of protein.

This legume might find widespread use as soil-improving (nitrogen-fixing) crop, an annual row crop, a cash crop (for human consumption), and home-grown protein feed for stock.

If the plant should prove satisfactory for all these purposes it would be superior to the legumes now used as fallow crops (cowpea, pigeon pea, Mucuna seed).

Its use in Nigerian agriculture could be justified purely on its nitrogen-fixing capacity if this were found to be superior to other crops. It is this particular aspect which will be the subject of future investigations on guar.

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Biotypes of Potato Wart in Newfoundland

The existence of biotypes of the causal fungus of potato wart, *Synchytrium endobioticum* (Schilb.) Perc., which differ in their ability to attack potato varieties in Europe has been documented by Ullrich[1]. Up to 1962, eight, and possibly ten, biotypes had been distinguished[2].

Potato wart has been known in Newfoundland since 1909 and is now found in all cultivated areas of the Island. It is distinctive in that it attacks a considerable number of varieties[3], such as 'Arran Victory', 'Kerr's Pink', 'Ackersegen', and 'Libertas', which are immune from wart Biotype 1 in Europe and Britain.

Because it was reported that 'Arran Victory' was not susceptible to wart in some districts of Newfoundland, an investigation was commenced in 1959 to see whether potato varieties would exhibit the same reaction to the wart disease in various parts of the province. Since the most significant information was obtained in 1962, the results reported here pertain only to that year.

Eleven potato varieties were planted in wart-infested land at five locations, namely: Bay Roberts, Eastport, Ferryland, Jamestown, and St. Shotts. Eastport was included because farmers in the area had found that 'Arran Victory' always remained free from wart infection. The four other locations were selected to sample representative wart-infested areas in eastern Newfoundland. The varieties used were 'Ackersegen', 'Arran Victory', 'Deodora', 'Katahdin', 'Kennebec', 'Kerr's Pink', 'Long Blue', 'Noordeling', 'Sebago', 'Ultimus', and 'Urgenta'. Each variety was planted in two rows of 10 hills each, randomized throughout the plot. The plants were harvested when growth was complete, and wart development was recorded.

Table 1. Varietal Response to Potato Wart Disease at Five Locations

Variety	Eastport	Bay Roberts	Ferryland	Jamestown	St. Shotts
'Ackersegen'	0	+ + +	+ + +	+ + +	Not included
'Arran Victory'	0	+ + +	+ + +	+ + + +	+ + + +
'Deodora'	+ +	+ +	+ + +	+ + +	+ + + +
'Katahdin'	0	+	+	+	+
'Kennebec'	0	+	+	0	+
'Kerr's Pink'	0	+ + + +	+ + + +	+ + + +	+ + + +
'Long Blue'	+ +	+ + + +	+ + + +	+ + +	+ + + +
'Noordeling'	0	0	0	0	+
'Sebago'	+	+	+	+	+
'Ultimus'	0	0	0	0	0
'Urgenta'	0	0	0	0	0

0, No infection; +, trace infection; + +, light infection; + + +, medium infection; + + + +, heavy infection.

The results are presented in Table 1.

It is evident that the varietal reaction to wart infection was almost the same at Bay Roberts, Ferryland, Jamestown, and St. Shotts, but not at Eastport. Five varieties which were susceptible at the first four locations remained free from attack at Eastport. The most obvious differences were exhibited by 'Ackersegen', 'Arran Victory', and 'Kerr's Pink'.

The wart proliferations developed on 'Deodora' and 'Long Blue' at Eastport were collected for further study in the greenhouse. 'Arran Victory', 'Deodora', 'Long Blue' and 'Sebago' were planted in 7-in. pots of steam-sterilized soil and inoculated by mixing crushed Eastport wart tissue with the soil covering the tubers. Three pots of each variety were grown for two months.

'Arran Victory' remained free from infection, all plants of 'Long Blue' were heavily infected, wart development in 'Deodora' varied from moderate to heavy, and, in 'Sebago', two plants developed light infection, while one remained healthy. Although they were not specifically included in this series, 'Arran Victory' plants inoculated with wart tissue collected from Bay Roberts have regularly become infected in the greenhouse.

Therefore, it is tentatively concluded from the above results that two biotypes of *Synchytrium endobioticum* are present in Newfoundland.

This investigation will be continued to assess the significance of small differences such as the freedom from infection of 'Kennebec' at Jamestown and the trace infection of 'Noordeling' only at St. Shotts, and to determine the distribution of the biotypes in the province.

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