Comparison of Microbial Growth in Organic and Conventional Lettuce

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Introduction

Many perceive organic food to be healthier than conventionally grown food due to absence of chemicals in the soil during the growth process. However, without pesticides there is a possibility of pathogenic microbes contaminating the produce and in turn, reducing its shelf-life. Green leafy vegetables like lettuce are eaten raw and thus even more prone to cause food-borne illnesses.

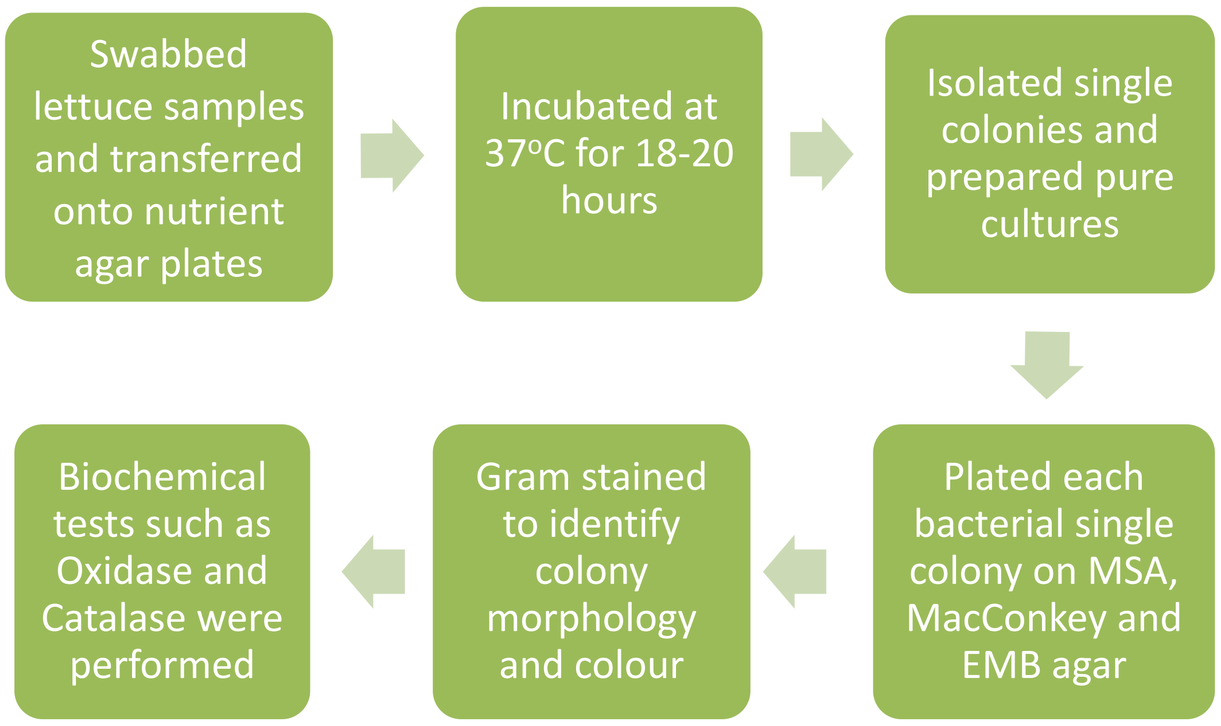
Previous studies have shown differing results on microbiological safety of organic food. Leff and Fierer, (2013) found more abundant microbial growth on organic lettuce as compared to conventional lettuce while Tango et al. (2014) did not see a difference between organic and conventional lettuce. However, there is limited information on the microbial safety profile of organic lettuce in a tropical country like Singapore.

Aims

•To investigate microbial growth in organically and conventionally-produced lettuce

•To determine the effect of microbial growth on the perishability of raw lettuce

Method



With reference to Kaur and Rai (2015),

Eosin Methylene Blue (EMB) agar is used to identify gram negative bacteria, Mannitol Salt Agar (MSA) is used to identify gram positive bacteria, and MacConkey agar is used to identify gram-negative enteric bacteria.

Oxidase test is performed by adding one drop of redox reagent (tetramethyl-p-phenylenediamine) to the inoculum on filter paper, and observing colour change from colourless to purple. Catalase test is performed by adding 2-3 drops of 3% hydrogen peroxide onto a bacterial suspension and observing for the appearance of gas bubbles.

Results

Table 1: Results from pure single cultures in conventional iceberg lettuce

Colony Number	Bacteria name	Gram stain	Oxidase	Catalase
1	*listeria*	+ rod	−	+
2	*bacillus*	+ rod	−	+
3	*Staphyloc-occus*	+ coccus	−	+
4	*klebsiella*	− rod	+	+
5	*escherichia*	− rod	−	+

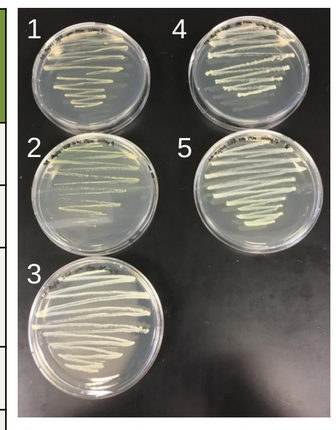


Figure 1: Representative plates of pure bacterial cultures in conventional lettuce

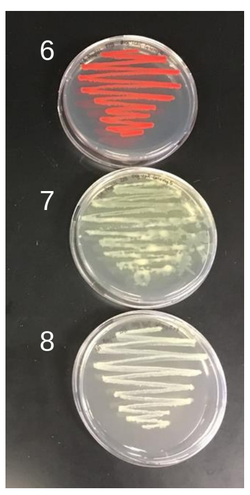


Figure 2: Representative plates of pure bacterial cultures in organic lettuce

Table 2: Results from pure single cultures in organic iceberg lettuce

Colony Number	Bacteria name	Gram stain	Oxidase	Catalase
6	serratia	*+ cocci*	−	+
7	pseudomonas	− rod	+	+
8	proteus	− rod	+	−

Discussion

❑ Quantity of bacteria in organic lettuce was found to be more than that of conventional lettuce. This could be due to the relatively chemical-free soil composition of organic vegetables.

❑ All bacteria identified in both conventional and organic lettuce are non-pathogenic, but certain species such as *Bacillus* are commonly found to cause decay and food spoilage (Shurtleff and Aoyagi, 2000).

In conclusion, there was no significant difference in the number of microbial species isolated from lettuce from different sources. However, organic lettuce decayed about one week earlier than conventional lettuce. As such, it is not advisable to consume lettuce after being kept for more than a week, even if stored in the fridge (Mishra *et al.,* 2016).

References

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[4] Shurtleff, W & Aoyagi, A. 2000. Sanitation, 2, 106-114.

[5] Tango, C. N., Choi, N. J., Chung, M. S. & Oh, D. H. 2014. Journal of Food Protection, 77, 1411-1417.