

The Application of Knowledge Mining to the Discovery of Trends in Future Agricultural Technological Development

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Background

For governments, technological development has become a driving force to promote the national competitiveness and to sustain economic growth. The use of advanced informational tools to detect trends in technological development from the large pool of academic literature will contribute greatly to the formulation of technological policies. The ability to predict future trends in technological development enable governments to draft and formulate important policies concerning technology.

Problem

With the advent of the knowledge economy, Taiwan's agriculture has been forced into a transitional stage, and its scientific and technological development as well as its industry both needs a new direction. To better understand trends in global agricultural development and agricultural basic sciences, this research project will target agricultural basic science, and suggest new forms of agriculture. It will also covers possible changes of and trends in the discipline of basic science. By analyzing the time, themes, and other structured data of agricultural literature, we aim at acquiring a clearer understanding of emerging subjects and possible trends in the field of agricultural studies.

Methodology

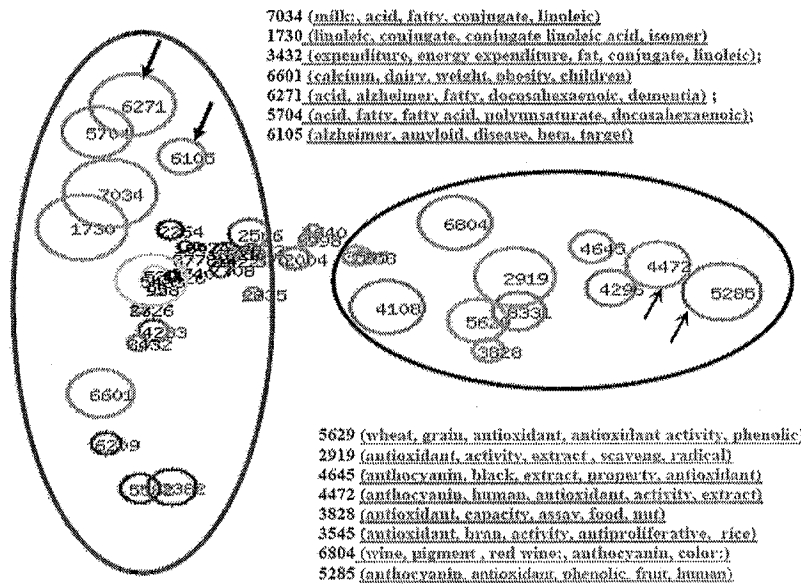
Research front analysis refers to the identification of the most highly cited papers in the multiple disciplines of the Essential Science Indicators, (ESI). Sixty-four research fronts in the field of agriculture were downloaded from the ESI database in July 2007. They were manually divided into five categories (which including nutrition and health, testing and diagnosis, ecology and environment protection, production technology, biotechnology). The category of nutrition and health accounted for the largest share at 39%. In order to expand the pool of papers samples, 5,970 papers citing the nutrition and health research fronts were located for citation and co-word analyses. [Tadayoshi, 2002; Tseng et al., 2007] For each identified cluster, a cluster title generation algorithm

is applied to obtain a set of cluster descriptors for helping human analysts in interpreting the results. Also used technique was multi-dimensional scaling to get theme maps for visual analysis [Noyons, and Van Raan,1998].

Results

The results were presented to the domain experts in form of theme maps, as shown in Figure 1. According to the figure, two main groups were found. One group is the extraction of cyaniding, bioflavonoids and resveratrol. These keywords describe anti-oxidants in fruits and herbs. Those substances are found to have antioxidant activity 50 times more than that of vitamin E. The other group describes the nutritional requirements that humans need in their diets in order to resist diseases. For example, conjugated linoleic acid (CLA) is a fatty acid found naturally in meat and dairy food. One study found that conjugated linoleic acid may help burn and loose fat by increasing energy expenditure[Stark et al., 2007]. Furthermore, DHA-rich diet (include omega-3 fatty acid) may help prevent Alzheimer's disease. On the other hand, a new study of coffee and diabetes has shown that men who drank 6 cups of coffee a day reduced their chances of developing type-2 diabetes by half, and women who drank the same amount cut their risk by 30 percent [Du et al., 2007].

Figure 1 Research front Analysis of Nutrition for Health Topics in Agriculture Research.



Conclusion

From the results, experts infer that nutrition and health are the mainstream of future agricultural development. It also suggests that the development of agriculture has been gradually changed. In the past, main agricultural issues involved food shortage or malnutrition problems. Nowadays, with the increasing development in scio-economics, major agricultural issues shifted to preventing chronic illness and fighting aging. These science mapping results reflect these

observations. Therefore, the methodology and analysis of this research project can function as a reference for the identification of development trends and directions in other agricultural disciplines.

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