Network science tools show that spices in Indian cuisine make meals much less likely to have common flavored ingredients

March 5 2015, by Bob Yirka

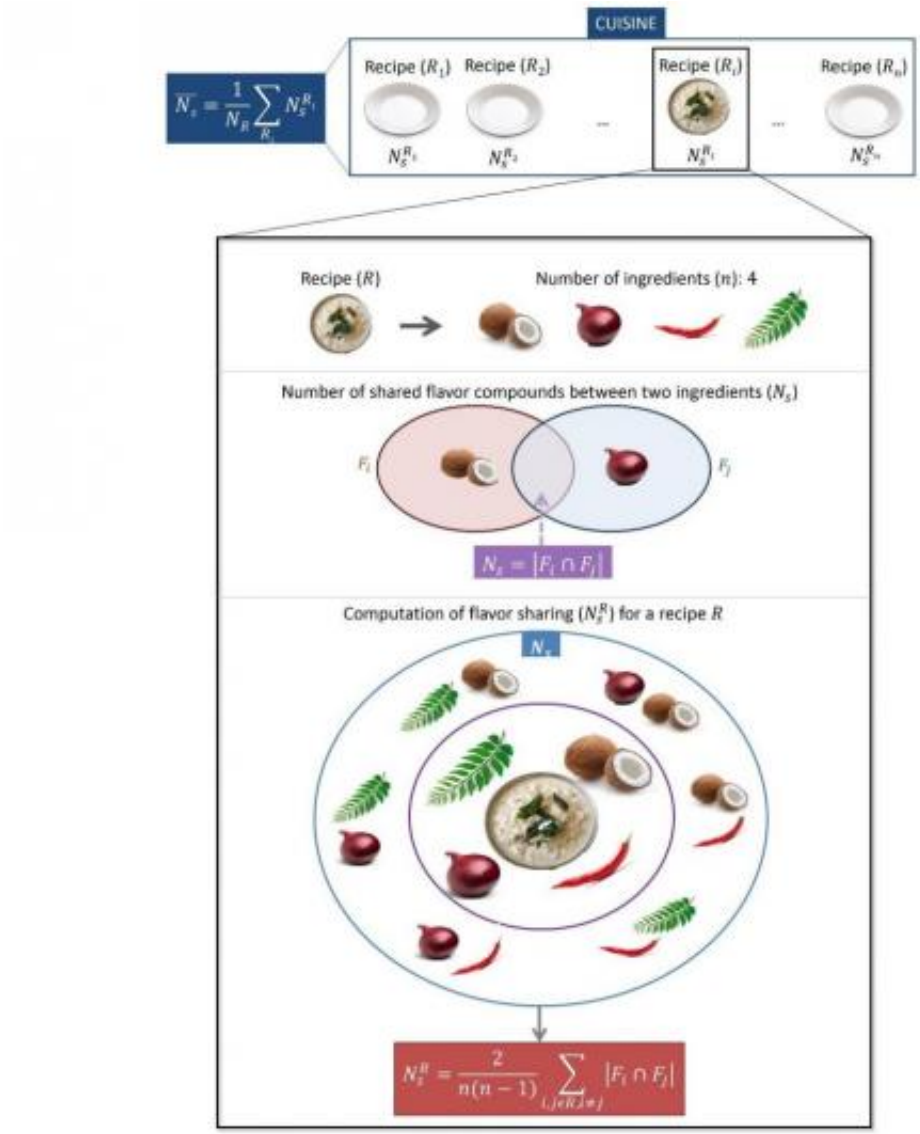


Illustration of procedure used for computation of average food pairing of a

cuisine. Starting from the cuisine data and flavor profiles of ingredients, average number of shared compounds in each recipe was computed. The average food pairing of a recipe set was further computed to enumerate flavor sharing. Credit: arXiv:1502.03815 [physics.soc-ph]

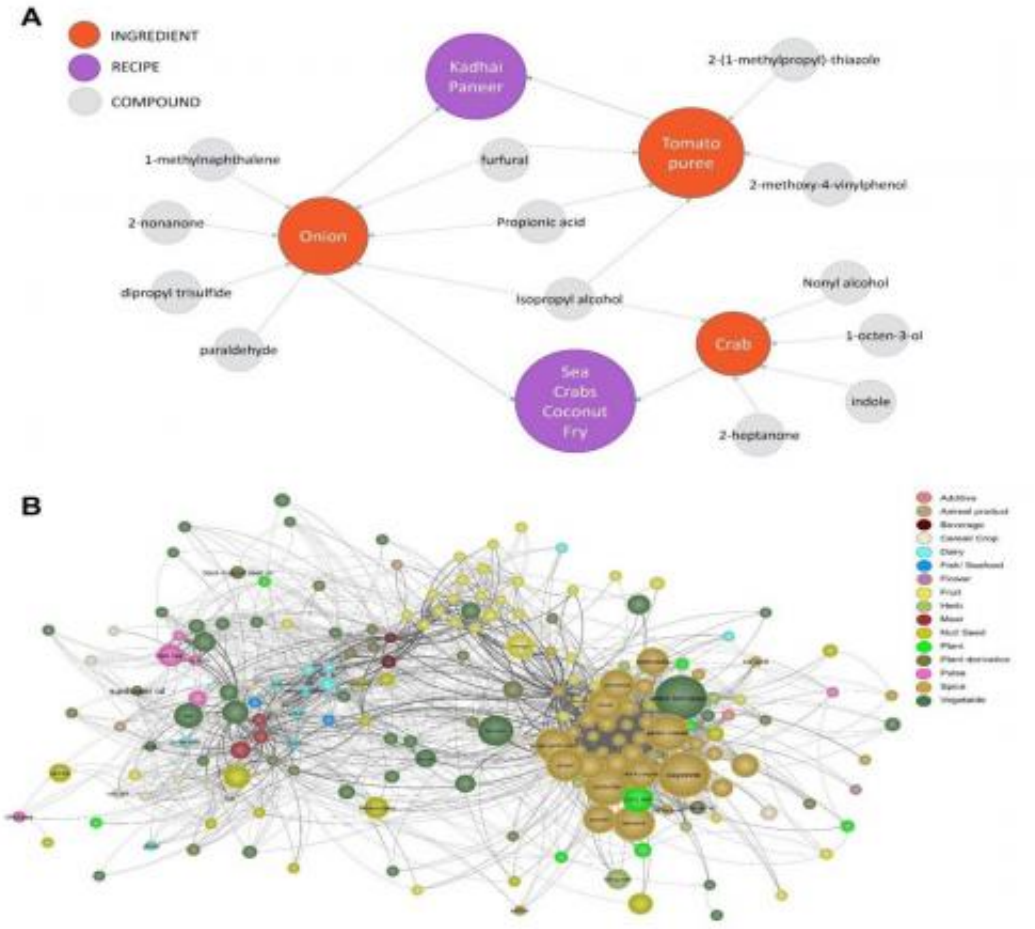
(Phys.org)—A team of researchers at the Indian Institute of Technology has found that unlike western cuisine, ingredients in Indian food are less likely to have flavors in common. In their paper uploaded to the preprint server *arXiv*, the team describes how they applied network science to cuisine and found curious differences between food recipes from the two cultures.

It is an accepted practice in western cultures to mix ingredients that have flavors in common when creating a new kind of dish—the flavors are thought to complement one another, leading to an overall satisfying taste. In this new effort, the researchers found nearly the opposite approach in Indian cooking. Instead of using complimentary ingredients, it is much more common to find what they call negative pairing—ingredients that do not have flavors in common.

To come to this conclusion, the team downloaded over 2,500 recipes from publicity available online sites with examples of cuisine from various parts of the country and then put all the ingredient information into a database. Then, instead of crunching data the old fashioned way, the team applied network science—which is where nodes are created with links between them indicating associations. It is the associations that appear graphically that lead to new insights into the data that is represented. In the case of Indian cuisine, the team found few associations between flavors in individual recipes. But that was not all—they also were able to see that when certain spices were added to a dish, it generally meant there were even fewer associations. Adding a

spice such as cayenne pepper, for example, generally meant that the ingredients had very little if any flavors in common.

The research team suggests that the reason dish creation has evolved so differently in India versus the west, is likely because of the medicinal impact that adding spices has on food—many help to keep it from spoiling. They note also that now that this pattern has emerged, it might be useful for chefs attempting to create new Indian dishes—knowing which spices impact flavor pairing in which ways can be very helpful. They suggest their study also highlights the benefits of using network science in studying relationships between ordinary things in everyday life.



. Construction of flavor graph. (A) Illustration for construction of flavor graph of a cuisine starting from its ingredients set and their flavor profiles. (B) The backbone extracted (3) flavor graph of Indian cuisine. Ingredients are denoted by nodes and presence of shared flavor profile between any two ingredients is depicted as a link between them. The color of node reflects ingredient category and thickness of edges is proportional to extent of flavor profile sharing. Node size is scaled to the ingredient's contribution to negative food pairing of the cuisine. Credit: arXiv:1502.03815 [physics.soc-ph]

More information: Spices form the basis of food pairing in Indian cuisine, arXiv:1502.03815 [physics.soc-ph] arxiv.org/abs/1502.03815

Abstract

Culinary practices are influenced by climate, culture, history and geography. Molecular composition of recipes in a cuisine reveals patterns in food preferences. Indian cuisine encompasses a number of diverse sub-cuisines separated by geographies, climates and cultures. Its culinary system has a long history of health-centric dietary practices focused on disease prevention and promotion of health. We study food pairing in recipes of Indian cuisine to show that, in contrast to positive food pairing reported in some Western cuisines, Indian cuisine has a strong signature of negative food pairing; more the extent of flavor sharing between any two ingredients, lesser their co-occurrence. This feature is independent of recipe size and is not explained by ingredient category-based recipe constitution alone. Ingredient frequency emerged as the dominant factor specifying the characteristic flavor sharing pattern of the cuisine. Spices, individually and as a category, form the basis of ingredient composition in Indian cuisine. We also present a culinary evolution model which reproduces ingredient use distribution as well as negative food pairing of the cuisine. Our study provides a basis for designing novel signature recipes, healthy recipe alterations and

recipe recommender systems.

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