Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

December 2019, Volume 32, Issue 2, Page 236-238

Spices in the eastern Indian laterite soil have more polyphenols?

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ARTICLE INFO

Article history:
Received 19 November 2018
Revision Received 25 May 2019
Accepted 5 August 2019

Key words:
phytochemicals, laterite, spice, health, precision farming, onion, chilli, turmeric

ABSTRACT

Chilli and onion samples from Bemetara district of Chhattisgarh state is found to contain 0.66% Capsaicin and 1,243 mg/kg Quercetin as estimated using HPLC method. This is 3 times and 30% more than the famous "Nashik" and "Guntur" varieties respectively, famous for these crops. Similarly, Turmeric from Odisha is found to possess 5.8% curcumin, nearly double that of the famous "Sangli" variety in Maharashtra or "Salem" of Tamil Nadu, but 25% less than the Meghalaya one. Higher polyphenol levels in India may be attributed to metabolic stress in laterite soils. Potency can however increase with precision agro-technology such as optimal potash inputs. Their branding and export can double farmers' income in resource poor states.

Introduction

Active ingredient, anti-oxidant, functional foods, super-food are keywords in health and agriculture today (Wilson *et al.,* 2013). Capsaicin and quercetin from chilli and onion respectively are two such wonder-chemicals famous in the west today, like curcumin from turmeric, due to their healing powers (Daaimei *et al.,* 2012). These are already used in making pain killer and anti-cancer drugs, respectively. Villagers know their local cultivars as stronger, more pungent traditionally, but not are tested. We tested quality of the spice crops from the lateritic soils in Chhattisgarh state and Turmeric from Orissa state by obtaining samples from local farmers, and compared it with published literature.

Materials and Methods

Samples of chilli and onion and the red soil sample from Kareli village, Berla tehsil, Bemetara district were tested. The soil was clarified as "alfisol" *i.e.* red and yellow (http://chtenvis.nic.in/soil.html) akin to laterite, rich in iron (5%), copper (7%), manganese (2.5%) but low in nitrogen (323 kg/ha), phosphorus (2 kg/ha), potassium (104 kg/ha) and organic carbon (0.5%). Chilli variety named "Teja" while onion is "N-53" of Patel Seeds Co., Nasik and Baroda (released originally by Mahatma Phule Krishi Vidyapeeth, Rahuri) from were tested for Capsaicin and Quercetin content respectively at Anacon laboratory, Nagpur (accredited by NABL), using HPLC technique vide FSSAI guidelines (Anon, 2015). Turmeric sample from Kandhmal district, Orissa was similarly analyzed.

Results and Discussion

We found capsaicin and quercetin levels of 0.6% and 0.12% (1243 mg/100 g), respectively in Chilli and Onion. This is about 2-3 times the value reported for their famous/reference varieties (Table 1). Curcumin level in Kandhmal, Orissa state was found 5.8% which was double that of samples from Tamil Nadu, but 25% lower when compared to turmeric collections from Meghalaya (Anon, 2018 a,b).

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Table 1. Active Ingredient content in the spices

Species	Chilli	Onion	Turmeric
This study			
Chhattisgarh	0.6%	1,243 mg/kg	-
Orissa	-	-	6%
Maharashtra	0.67%	-	-
Literature			
Famous brand value	Guntur – 0.22%	Nasik[6] - 890 mg/kg	Sangali-3%, Salem-2%
Reference	Spice Board	Dalamau *et al*. (2010)	Daimei *et al.* (2012)

Chilli around Nagpur with similar capsaicin value is already famous as "Bhiwapur" like "Guntur" and "Byadgi" varieties of Andhra and Karnataka states, respectively (Anon, 2016).

The primitive agriculture in eastern India has low external inputs, but shows high potency, primarily due to environmental stress, very likely due to the nutrient poor and high drainage lateritic soils, probably resulting in higher secondary metabolite content (Slemar and Klienwachter, 2013). For instance, curcumin content in Orissa state Turmeric is among the highest in India vide a study by Orissa University of Agriculture Technology (Akbar *et al.,* 2018). Agronomic improvement of crops for enhanced biomolecules is warranted, as curcumin is known to increase with potash application (Karthikeyan *et al.,* 2009) or organic inputs (Singh *et al.,* 2016), and crop geometry reported to raise capsaicin content, in the famous "Bhut Jolokia" variety of north-eastern India-hottest in the world (Moringathem *et al.,* 2014). In fact, Table 2 lists the curcumin content here and the literature in decreasing order. Top 3 states as in the table 2 have predominantly lateritic soils and Turmeric here is rich in curcumin.

Table 2. Curcumin content in the Turmeric across states

State	District	Curcumin %	Reference
Meghalaya	Jaintia	8	11
Orissa	Kandhmal	6	14
Kerala	Kozhikode	6	15
Madhya Pradesh	Gwalior	4	16
Maharashtra	Bhandara	4	17
Tamil Nadu	Erode	3	10, 12

As India is food surplus today due to bumper productivity, crop prices crash that causes farmers' distress. There is a need to focus on quality and nutrition, besides export. Hence, commoditization, geographic indication, branding, precision farming and value chain development can foster traditional varieties for health benefits. This was successful in the sugarcane and milk commodity development in western India or A-2 branding of Indian breed cows today. Meghalaya state Government has launched mission for Lakadong turmeric variety (Anon, 2018 a, Daimei *et al.,* 2012) and Odisha state obtained geographic indication for "Kandhmal" type Turmeric (Anon, 2018 b). Such approach can help to double farmer's income and evergreen revolution in the resource poor states in eastern India by-passed by green revolution (Anon, 2001; Swaminathan, 2000).

Acknowledgements

We thank the Directors of ICAR Institutes, NIBF (Raipur) and Principal, Government College, Jamgao-R for their support and. We thank farmers Mr Thanedra Verma, Kareli village, Berla taluka for sharing onion and chilli samples; Mr. Narendra Taywade, Wagholi villae, Morshi Taluka, Amaravati district, Maharashtra provided local chilli sample; Mr. Birupakhya Nanda, Balasore & Mr. Kamal Digal, Kandhmal for turmeric samples.

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