



COMMON ADULTERANTS IN SOME TRADED SPICES

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Spices being a valuable commodity used in food and pharmaceutical industries form an important class of agricultural commodity of international commerce. Traded forms of spices are subjected to admixing and/or substitution with cheaper and inferior substances by design or default. The adulterants range

from synthetic substances to earthy materials and products of related plant species (biological). More common adulterants in some of the traded spices are presented in Table 1. Value added commodities are at the risk of direct adulteration besides the use of raw adulterated whole spice in their manufacture.

Methods based on morphological/anatomical characterization and organoleptic markers (odour, colour, texture) or chemical/biochemical testing besides the latest DNA based biotechnological means are now available to detect the adulterants and ensure the safety of the traded spices depending on the situation.

Table 1. Common adulterants in some of the traded spices

Commodity	Adulterants	
	Chemical / earthy material	Biological
Black pepper berries (<i>Piper nigrum</i>)	Mineral oil chaff of black pepper.	Dried papaya seed (<i>Carica papaya</i> , wild <i>Piper</i> spp. (<i>P. attenuatum</i> and <i>P. galeatum</i>), fruits of <i>Lantana camara</i> and <i>Embelia ribes</i> , seeds of <i>Mirabilis jalapa</i> , berries of <i>Schinus molle</i> , exhausted black pepper, light berries, stems and
Black pepper powder	Dye	Powdered papaya seed, wild <i>Piper</i> berries, <i>Lantana camara</i> , <i>Embelia ribes</i> , <i>Mirabilis jalapa</i> seeds, <i>Schinus molle</i> berries, exhausted black pepper and light berries; starch from cheaper source
Chilli fruits (<i>Capsicum annum</i>)	Dyes, mineral oil	-
Chilli powder	Dye- coal tar red, sudan red, para red; vanilyl- n-nonamide; mineral oil; talc powder; brick powder; salt powder.	Powdered fruits of 'Choti ber' (<i>Ziziphus nummularia</i>), red beet pulp, almond shell dust, extra amounts of bleached pericarp, seeds, calyx, and peduncle of chilli, starch of cheap origin; tomato wastes.
Turmeric powder (<i>Curcuma longa</i>)	Dye- metanil yellow, orange II, lead chromate; chalk powder; yellow soap stone powder.	Wild <i>Curcuma</i> spp. <i>C. zedoaria</i> Rosc or 'yellow shotti' syn. <i>C. xanthorrhiza</i> Roxb. ('Manjakua') or <i>C. malabarica</i> , starch from cheaper source, saw dust.
Ginger (<i>Zingiber officinale</i>)	Lime, capsaicin.	Exhausted ginger (volatile oil extracted).
Ginger powder	Lime	Capsicum, grain of paradise (<i>Amomum melegueta</i>), turmeric, exhausted ginger fortified with flavours, Japanese ginger (<i>Zingiber mioga</i>), flour.
Cardamom fruits (<i>Elettaria cardamomum</i>)	Small pebbles	Orange seeds, un roasted coffee seeds.
Cardamom seeds <i>A. cardamomum</i>	-	Seeds of <i>Amomum aromaticum</i> , <i>A. subalatum</i> and
Cardamom seed powder	-	Powdered cardamom hulls





Commodity	Adulterants	
	Chemical / earthy material	Biological
Nutmeg(<i>Myristica fragrans</i>)	Pieces of clay for repairing broken nutmeg	Wild species- Macassar (<i>Myristica argentea</i>), Bombay nutmeg (<i>M. malabarica</i>) and <i>M. otoa</i>
Mace (<i>Myristica fragrans</i>) mace (<i>M. argentea</i>).	-	Bombay mace (<i>Myristica malabarica</i>); Macassar
Clove (<i>Eugenia aromaticum</i>)	Magnesium salt, sand, earth	Exhausted clove (volatile oil extracted), stem and fruits of clove.
Cinnamon bark(<i>Cinnamomum verum</i>)	-	Cassia (<i>Cinnamomum cassia</i>)
Cinnamon powder	Eugenol, cylon oil, yellow brown dye	Aromatized and powdered beechnut husk; hazel nut, almond shell dust.
Cassia bark (<i>Cinnamomum cassia</i>)	-	Bark of <i>Cinnamomum japonicum</i> , <i>C. mairei</i> , <i>C. burmannii</i> .
Allspice powder (<i>Pimenta dioica</i>)	-	Powdered clove stem, berries of <i>Myrtus tobasco</i> and <i>Lindera benzoin</i>
Aniseed(<i>Pimpinella anisum</i>)	Fine earth materials	Hemlock fruit, parsley, dill fruit
Aniseed powder	-	Fennel
Star anise (<i>Illicium verum</i>).	-	<i>Illicium anisatum</i> fruit
Star anise powder	-	<i>Illicium anisatum</i> powder
Nigella seeds (<i>Nigella sativa</i>)	-	Onion seeds(<i>Allium cepa</i>)
Caraway (<i>Caravum carvi</i>)	-	Cumin(<i>Cuminum cyminum</i>), <i>Carum bulbocastanum</i>
Fennel(<i>Foeniculum vulgare</i>)	-	Exhausted or partially exhausted fennel fruits; stem tissue and stalks of fennel, umbelliferous seeds.
Mustard seed (<i>Brassica nigra</i> ; <i>B. juncea</i>)	-	Argemone seeds (<i>Argemone mexicana</i>), rape seed, (<i>Brassica napus</i>) ragi (<i>Eluesine coracana</i>)
Mustard seed powder	-	Added starch, turmeric
Poppy seed (<i>Papavar somniferum</i>)	-	Rajeera seeds (<i>Amaranthus paniculatas</i>)
European dill(<i>Anethum graveolens</i>)	Terpenes	Indian dill(<i>Anethum</i> spp.)
Ajowan(<i>Trachyspermum ammi</i>)	Earthy materials	Exhausted ajowan seeds, excess stem and chaff.
Mediterranean oregano (<i>Origanum vulgare</i>)	-	<i>Origanum majorana</i> , <i>O. Syriacum</i> , <i>Satureja montana</i> , <i>Thymus capitatus</i> , <i>Rhus coriaria</i> , <i>Cistus incanus</i>
Asafoetida(<i>Ferula asafoetida</i>)	Coal tar dyes, gypsum, red clay, chalk-	Foreign resin- gum arabic, gum resin colophony, galbanum, moriacum, resin, rosin; Barley, wheat or rice flour, slices of potato
Saffron(<i>Crocus sativus</i>)	Synthetic dyes- tartrazine, ponceau 2R, sunset yellow, amaranth, orange GG, methyl orange, eosin and erythrosine, oil, honey, glycerine, solutions of potassium or ammonium nitrate, sodium sulphate, magnesium sulphate, barium sulphate, borax.	Different parts of the saffron flower itself (styles, stamens, strips of the corolla), dried petals of safflower and Scotch marigold, calendula, poppy, arnica, onion skins, turmeric, annatto, stigmata from other species of <i>Crocus</i> , pomegranate, spanish oyster and maize; dyed corn silk; meat fibre, red sandal wood; turmeric powder, paprika powder.
Vanilla beans(<i>Vanilla planifolia</i>)	-	Tonka beans (<i>Dipteryx odorata</i>), <i>Dipteryx oppositifolia</i> , vanillon (<i>Vanilla pompona</i>); little vanilla (<i>Selenipedium chica</i>), leaves of orchid <i>Agreacum fragrans</i> and <i>Orchis fusca</i> , ladie's tresses (<i>Spiranthes cernua</i>), 'vanilla-plant' (<i>Trilisa odoratissima</i>), 'herb vanilla' (<i>Nigritella angustifolia</i>) and common sweet clovers (<i>Melilotus</i> spp.)
Vanilla extract	Synthetic vanillin, ethyl vanillin, veratraldehyde, piperonal, vanitrope and coumarin	

Source: Dhanya, K and B. Sasikumar (2010). Curr. Trends in Botech. and Pharm. 4(1): 454-489.