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(Received : May 2002; Revised : February 2003)

Madras Agric. J. 90 (4-6) : 379-381 April-June 2003

Research Notes

Effect of different agro-wastes on mineral content of edible (dehydrated) mushrooms

V.K. MANDHARE, A.V. SURYAWANSHI, V.T. JADHAV AND H.B. PATIL
Mahatma Phule Krishi Vidyapeeth, Rahuri-413 722, Maharashtra

Mushroom is a form of plant life, a fungus and is being used by man as food since time immemorial. Mushrooms provide a rich addition to the diet in the form of protein, valuable salts of phosphates, potassium, sodium, sulphur, magnesium, calcium, chlorides, silicates, iron, copper, zinc, manganese, molybdenum and vanadium. For vegetarians, mushrooms add valuable proteins, vitamins and minerals. Verma *et al.* (1987) reported that *Pleurotus sajor-caju* contain phosphorus-1542, calcium-1360, sodium-710, potassium-3125 and iron-14.46 mg/100 g. High potassium: sodium ratio content of mushrooms is excellent for the persons suffering from hypertension and heart diseases (Rai *et al.* 1998). The present study was therefore conducted to evaluate *Pleurotus* spp. in order to get an idea of the status of various mineral content in it. Though, the mineral content of some mushroom species are known, there is no literature available on effect of different agro-wastes on mineral content of *Pleurotus* spp.

The *Pleurotus* spp. *viz. P.sajor-caju, P.eous, P.flabellatus, P.florida* and *P.sapidus* were grown on different agro-wastes *viz.* soybean, wheat, paddy, cotton and their combinations (1:1) during 1999-2000 at Department of Plant Pathology, College of Agriculture, Parbhani and the mineral contents were estimated at Department of Biochemistry, College of Food Technology, M.A.U., Parbhani. The mushroom samples were harvested during various stages, dehydrated in cabinet dryer (40°C for 6 to 8 hours) and ground to fine powder (60 mesh), packed in bottles and stored in refrigerator till used for analysis.

The chemical estimates were considered in RBD with five replications and the mean values have been reported. The samples were digested in tri-acid mixture. For digestion 1g of powdered samples of dehydrated mushrooms from various harvestings were taken in 100ml conical flask, 5ml of conc. HNO_3 was added to it and kept overnight. On next day 10ml of tri-acid mixture (HNO_3: H_2SO_4 and $HClO_4$) in 10:1:4 ratio was added and digested on hot plate as described by Piper (1966). After digestion, the material was filtered (Whatman No.1) filter paper and volume was made to 100 ml. This acid digest was used for the determination of minerals *viz.* phosphorus, potassium, sodium, calcium and iron (Jackson, 1958). Phosphorus content was determined by Vanadomolybdate yellow colour method as described by Piper (1966). Sodium and potassium content were determined by using Flame Photometer (Chapman and Pratt, 1961). Calcium content was estimated by the versenate titration method (Black, 1965). The iron content was determined on Spectro-photometer at 480 nm (Ranganna, 1995).

The mineral contents of *Pleurotus* spp. differed significantly when grown on different

Table 1. Mineral content (mg/100g) of different *Pleurotus* species (Dehydrated)

Substrates	Phosphorus (P)					Potassium (K)					Sodium (Na)					Calcium (Ca)					Iron (Fe)				
	P. sc	*P. e*	*P. fb.*	*P. fl.*	*P. sp.*	*P. sc*	*P. e*	*P. fb.*	*P. fl.*	*P. sp.*	*P. sc*	*P. e*	*P. fb.*	*P. fl.*	*P. sp.*	*P. sc*	*P. e*	*P. fb.*	*P. fl.*	*P. sp.*	*P. sc*	*P. e*	*P. fb.*	*P. fl.*	*P. sp.*
Soybean	1100	1400	920	1000	840	2540	2340	2080	2145	2042	330	160	180	225	175	320	340	340	340	320	19.60	17.81	16.62	17.21	15.40
Wheat	1000	1520	800	840	710	2600	2360	2380	2395	2095	340	140	185	205	182	380	360	320	320	340	18.12	16.06	15.94	16.21	14.78
Paddy	1100	1500	880	910	820	2620	2260	2400	2400	1995	355	140	180	200	180	340	330	340	340	310	18.31	14.06	16.93	17.17	15.11
Cotton	1160	1405	980	1020	915	2680	2120	2160	2205	1911	340	130	160	180	156	350	340	380	355	320	16.88	14.87	17.31	17.41	16.48
Soybean + Wheat	1180	1450	840	830	780	2520	2340	2060	2095	2190	350	150	180	192	170	360	345	350	310	300	19.06	15.56	14.75	15.25	13.33
Soybean + Paddy	960	1580	820	850	760	2540	2240	2313	2352	2108	320	160	160	175	160	360	360	360	335	335	16.25	16.62	14.87	15.35	13.67
Cotton + Paddy	1100	1500	940	960	900	2640	2173	2360	2380	2068	310	160	140	160	130	380	345	360	330	345	20.25	14.31	17.50	17.87	16.68
Cotton + Wheat	1000	1440	960	980	920	2600	2280	2520	2545	2145	340	140	160	175	150	360	320	360	350	350	17.18	15.00	17.93	18.05	16.99
S.E. ±	22.31	9.28	6.13	5.98	8.24	9.59	17.98	9.45	15.38	15.14	5.72	6.88	4.68	6.00	5.71	7.03	8.59	6.94	9.79	4.43	0.36	0.29	0.29	0.25	0.12
CD at 5%	67.59	28.11	18.58	18.13	25.00	29.07	54.48	28.43	46.59	45.87	17.33	21.85	14.18	18.19	17.30	21.32	NS	21.03	29.68	13.42	1.09	0.88	0.0	0.77	0.37

Where *P. sc* : *P. sajor-caju*, *P. fb.* : *P. flabellatus*, *P.sp.* : *P. sapidus*, *P.e.* : *P. eous*, *P. fl.* : *P. florida*

agro-wastes (Table 1). Th phosphorus content o *P.sajor-caju* was signifi cantly highest (1180 mg 100g) when grown or soybean + wheat straw The 'P' content of *P.eou* was highest (1580 mg 100g) when cultivated or soybean + paddy straw The 'P' content o *P.flabellatus* (980 mg/100g and *P.florida* (1020 mg 100g) was higher on cottor stalk. The 'P' content o *P.sapidus* was higher (92 mg/100g) when grown or cotton + wheat. The potassium content o *P.sajor-caju* (2680 mg 100g), *P.eous* (2360 mg 100g), *P.flabellatus* (238 mg/100g), *P.florida* (240 mg/100g) and *P.sapid* (2190 mg/100g) were higher when cultivated or cotton, wheat, paddy anc soybean + wheat straw The sodium content o *P.sajor-caju* was significantly higher (355 mg 100g) on paddy straw as compared to other *Pleurotus* spp. The Na content of other species ranged from 130 to 225 mg/100g when culti-vated on different agro-wastes.

The calcium content of *P.sajor-caju* was significantly higher (380 mg/100g) on wheat and cotton + paddy straw. It was higher with *P.eous* (360 mg/100g) when cultivated on wheat and soybean + paddy straw. The 'Ca' content of *P.flabellatus* (380 mg/100g) and *P.florida* (355 mg/100g) when cultivated on cotton stalk. The iron content of *P.sajor-*

caju (20.25 mg/100g), *P.eous* (17.81 mg/100g), *P.flabellatus* (17.93 mg/100g), *P.florida* (17.87 mg/100g) and *P.sapidus* (16.99 mg/100g) were significantly higher when grown on cotton + paddy, soybean, cotton + wheat, cotton + paddy and cotton + wheat straw.

It could be concluded from the results that the mineral contents of different *Pleurotus* spp. differed differently when cultivated on different agro-wastes. The *Pleurotus* spp. observed to be rich in phosphorus, iron, potassium and deficient in sodium and calcium and provide valuable nutrients to the diet. Due to high K/Na ratio, mushrooms were recommended to be the best food for the persons suffering from hypertension and heart diseases. Similar results in respect of mineral contents of *Pleurotus* spp. were reported earlier (Bisaria *et al.* 1987; Verma *et al.* 1987; Prasad, 1997; Rai *et al.* 1998). Alofe (1991). Ereifei and Raddad (1999) reported that the trace element contents were varied by species, stage of growth, type of substrates used, variety of mushroom and they also reported that mushrooms were the chief source of Ca, K, Mg, iron, P and Zn.

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(Received : August 2001; Revised : March 2003)

Madras Agric. J. 90 (4-6) : 381-383 April-June 2003

Research Notes

Effect of fungicides on *Phytophthora capsici* in black pepper

M. JAYASEKHAR
Horticultural Research Station, Tamil Nadu Agricultural University, Pechiparai-629 161.

Foot rot of black pepper caused by *Phytophthora capsici* Leonian emend A.Alizadeh and PH.Tsao is one of the major diseases which occurs both in nursery as well as in grown up vines. In view of the season bound nature of the disease and lack of early detection of root infection, fixed schedules of fungicides application are recommended. Wilson *et al.* (1974) studied the *in vitro* effect of different organic fungicides and reported that complete inhibition of growth of the fungus could be obtained with ceresan-wet, captafol, mancozeb, miltox and thiram.

In this study different fungicides *viz.* copper oxychloride, bordeaux mixture, carben-