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Response of distinct levels of Phosphorus, Zinc fertilization and Mycorrhizae on Capsicum (*Capsicum annuum* L.) in protected conditions

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Abstract
The present investigation was carried out to analyze the response of distinct levels of Phosphorus, Zinc and Mycorrhizae on capsicum crop during the year 2016. For this, a pot experiment was conducted in the net house of Department of Soil Science and water Management, Dr Y S Parmar University of Horticulture and Forestry Nauni, Solan (Himachal Pradesh). The treatment combination consists of 24 treatments comprising 4 levels of phosphorus: P_a- 0, P_b-237.5 kg ha^{-1} SSP, P_c-355.5 kg ha^{-1} SSP and P_d-475 kg ha^{-1} SSP, 3 levels of Zinc: Zn_a-5 kg ha^{-1} $ZnSO_4$, Zn_b-7.5 kg ha^{-1} $ZnSO_4$, Zn_c-10 kg ha^{-1} $ZnSO_4$ 2 levels of mycorrhizal inoculation: I_a-0 and I_b-15 g per pot. The results concluded that plant parameters like root length, plant height and total uptake by the plant increases as level of phosphorus, zinc and mycorrhizae increases. It also concluded that mycorrhizal inoculation resulted in increased plant growth and total nutrient uptake by alleviating Phosphorus or Zinc deficiency.

Keywords: P-Zn, antagonistic interactions, arbuscular mycorrhizae, capsicum

Introduction
Capsicum is a high value vegetable crop of family Solanaceae. In India capsicum is mainly cultivated in Himachal Pradesh, Karnataka, hilly areas of U.P and Tamil Nadu and Maharashtra. Capsicum or bell pepper is grown in temperate and sub-tropical regions of the world. This vegetable crop is a rich source of antioxidants, vitamins, flavonoids and also a balanced source of essential nutrients (Maria *et al*. 2010) [18]. The fruits of bell pepper are blocky, square or triangular in shape, eaten as raw, cooked as vegetable. The antioxidant property of ascorbic acid present in it helps in prevention of various diseases like cardiovascular diseases, cataracts and many more (Maldonado *et al*. 2002) [17]. For optimum production of plants, essential nutrients are required in balanced quantities. Phosphorus and Zinc are the two essential nutrients that are required for plant growth. Sometimes, excess rates of one nutrient can cause the deficiency of other nutrient in the plant tissue. High doses of Phosphorus can induce Zinc deficiency in the plants which is called as P- induced Zn deficiency. Growers mainly apply high amounts of Phosphorus fertilizer as compare to Zinc fertilizers hence, Zn-induced P deficiency is rare (Edwards and Kamprath, 1974) [10]. High level of Phosphorus application reduces availability of Zinc in plant tissues (Buekert *et al*. 1998) [6]. AMF on the other hand is an essential tool for reducing chemical inputs in modern agriculture (Douds *et al*. 2007) [8]. Mycorrhiza has been attributed to improved plant nutrition (Safir and Nelson, 1984) [24]. When applied in soils, VAM fungi enhanced plant growth and uptake of Phosphorus (Bhardwaj *et al*. 2019) [3].

It also plays an important role in Phosphorus and Zinc nutrition also in the availability of N, Cu, K and other nutrients (Frey and Schuepp, 1993) [11]. The plants inoculated with AM fungi found to have lower tissue zinc nutrition grown under toxic soil Zn concentration as compared to uninoculated plants (Dueck *et al*. 1986) [9]. Along with this, the status of water in inoculated plants with VAM fungi has been reported to be increased as compared to uninoculated plants (Sweatt and Davies, 1984) [28]. In mid hills conditions of the state, available Phosphorus in soil is comparatively high which may affect the Zinc uptake in the plants. Mycorrhizae colonization of plants under such conditions can improve the availability of essential nutrients. Keeping this in view the present study was conducted to see the response of distinct levels of phosphorus, Zinc and Mycorrhizae on capsicum in protected conditions.

Materials and Methods

The present investigation was carried out in mid hill conditions of Himachal Pradesh. For this pot experiment was conducted in the net house of Department of Soil Science and Water Management, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh). In summer, May-June months are moderately hot however December-January are the coldest ones. Maximum rainfall received during June to September in this area and average annual rainfall is about 1100 mm. There were 24 treatment combinations and treatment details are given as follow:

Table 1: Treatment combinations without mycorrhiza

Treatment combinations without mycorrhiza	Treatment combinations with mycorrhiza
$Treatment_1$: $P_aZn_aI_a$	$Treatment_{13}$: $P_aZn_aI_b$
$Treatment_2$: $P_aZn_bI_a$	$Treatment_{14}$: $P_aZn_bI_b$
$Treatment_3$: $P_aZn_cI_a$	$Treatment_{15}$: $P_aZn_cI_b$
$Treatment_4$: $P_bZn_aI_a$	$Treatment_{16}$: $P_bZn_aI_b$
$Treatment_5$: $P_bZn_bI_a$	$Treatment_{17}$: $P_bZn_bI_b$
$Treatment_6$: $P_bZn_cI_a$	$Treatment_{18}$: $P_bZn_cI_b$
$Treatment_7$: $P_cZn_aI_a$	$Treatment_{19}$: $P_cZn_aI_b$
$Treatment_8$: $P_cZn_bI_a$	$Treatment_{20}$: $P_cZn_bI_b$
$Treatment_9$: $P_cZn_cI_a$	$Treatment_{21}$: $P_cZn_cI_b$
$Treatment_{10}$: $P_dZn_aI_a$	$Treatment_{22}$: $P_dZn_aI_b$
$Treatment_{11}$: $P_dZn_bI_a$	$Treatment_{23}$: $P_dZn_bI_b$
$Treatment_{12}$: $P_dZn_cI_a$	$Treatment_{24}$: $P_dZn_cI_b$

Plant and Soil analysis

Plant parameters like plant height and root length was measured after harvesting. The macronutrient content of plant was estimated as; Nitrogen determined by micro-kjeldahl method (A.O.A.C, 1980) [1], Phosphorus determined by method given by Jackson (1973) [13] and Potassium content determined by flame photometric method. The micronutrient content of plant i.e. Fe, Mn, Zn and Cu were estimated in Atomic Absorption Spectrophotometer. Soil analysis was carried out by determining Organic Carbon by rapid titration method (Walkley and Black, 1934) [29]; available Nitrogen was estimated by Alkaline Potassium permanganate method given by Subbiah and Asija (1956) [26]; Phosphorus by method given by Olsen *et al*. (1972) [22]; Potassium by Ammonium Acetate method given by Merwin and Peech (1951) [21]. Micronutrient cations in soil i.e. Fe, Mn, Zn and Cu were estimated on Atomic Absorption Spectrophotometer (Lindsay and Norwell, 1978) [15].

Results and Discussions

Above ground portion

The data presented in Table 2 revealed that, among above ground portion, maximum plant height (74.0 cm) was observed in $P_dZn_cI_b$ whereas minimum plant height 40.5 cm was observed in $P_aZn_aI_a$. These observations are similar with results observed by Cwala *et al*. (2010) [7]. They concluded that growth of capsicum plant was affected by mycorrhizal inoculation. Among macronutrient content of leaves, fruit and shoot, the maximum total Nitrogen content (10.08%) was observed in $P_dZn_cI_b$ (T_{24}) and minimum total Nitrogen content (7.12%) was observed in $P_aZn_aI_a$ (T_1). Similar results were also reported by Sreenivasa *et al*. (1993) [25] who found that arbuscular mycorrhizae fungi increase the translocation as well as uptake of nitrogen in the plant. The maximum value of total Phosphorus content (1.20%) was observed in $P_dZn_aI_b$ (T_{22}) and minimum total Phosphorus content (0.67%) was observed in $P_aZn_cI_a$ (T_3). These results are in line with Benvindo *et al*. (2014) [2] who observed that with application of Phosphorus, total Phosphorus content in leaves increased. The maximum total Potassium contents (11.30%) were observed in $P_aZn_cI_b$ (T_{15}) and minimum total Potassium content (9.32%) were observed in $P_dZn_aI_a$ (T_{10}). These results are similar with those of Maksoud *et al*. (1994) [16], who found that inoculation with Arbuscular Mycorrhizae enhanced the total Potassium content in plant. Among micronutrient content in plants, maximum total Fe content (448.57 mg kg^{-1}) was observed in $P_aZn_aI_b$ (T_{13}) and minimum total Fe content (214.00 mg $kg^{-1}$and) was observed in $P_dZn_cI_a$ (T_9). These findings were also observed by Halder and Mandal (1981) [12], who reported that with increase in phosphorus application, there is decrease in Fe content in shoots. The total manganese content (263.00 mg kg^{-1}) was observed in $P_aZn_cI_b$ (T_{15}) and lowest total Mn content (210.95 mg kg^{-1}) was observed in $P_dZn_aI_a$ (T_{10}). The present results are in accordance with those of Halder and Mandal (1981) [12], who found that with application of phosphorus, total manganese content in shoots was decreased. The data presented in Table 2 also shows that higher total Zn content (84.77 mg kg^{-1}) in $P_aZn_cI_b$ (T_{15}) and lowest total Zn content (53.47 mg kg^{-1}) in $P_dZn_aI_a$ (T_{10}). Similar results were also obtained by Ortas *et al*. (2011) who concluded that total zinc content of plant increased by the inoculation of plant with *Glomus mosseae, G. intraradices,,G. etunicatum, G. clarum, G. caledonium* as compared to control. The Maximum total Cu content (48.00 mg kg^{-1}) was observed in $P_aZn_aI_b$ (T_{13}) and lowest total Cu content (31.05 mg kg^{-1}) was observed in $P_cZn_cI_b$ (T_{21}). The application of phosphorus caused a decrease in the total content of copper in the shoots was also reported by Halder and Mandal (1981) [12]. In three factor interaction among P, Zn and mycorrhizae, highest total nutrient uptake by above ground portion (4.87 g $plant^{-1}$) was observed in $P_dZn_cI_b$ (T_{24}) and lowest (2.89 g $plant^{-1}$) was observed in $P_aZn_aI_a$ (T_1).

Similar results were also observed by Bhardwaj *et al*. (2020) [4, 5]; they recorded that macro and micronutrient uptake increased by mycorrhizal inoculation.

Table 2: Response of distinct levels of Phosphorus, Zinc and Mycorrhizae on above ground portion (shoot):

Treatments combinations	Plant height (cm)	N (%)	P (%)	K (%)	Fe (mg kg^{-1})	Mn (mg kg^{-1})	Zn (mg kg^{-1})	Cu (mg kg^{-1})	Total uptake (g $plant^{-1}$)
$P_aZn_aI_a$	40.5	7.12	0.75	9.87	333.36	237.30	66.48	46.30	2.89
$P_aZn_bI_a$	43.5	7.17	0.73	10.10	317.00	242.78	75.83	43.83	3.01
$P_aZn_cI_a$	43.4	7.32	0.67	10.13	309.00	249.23	79.13	35.90	3.09
$P_bZn_aI_a$	42.0	7.16	0.83	9.74	311.43	223.88	60.58	45.70	2.91
$P_bZn_bI_a$	44.0	7.22	0.77	9.91	286.00	234.80	65.83	37.70	3.06
$P_bZn_cI_a$	44.0	7.52	0.75	9.96	256.62	244.80	73.78	35.00	3.20
$P_cZn_aI_a$	46.5	7.73	0.86	9.45	301.00	215.78	57.78	41.80	3.33
$P_cZn_bI_a$	46.5	8.05	0.78	9.83	282.00	217.67	60.07	37.30	3.50
$P_cZn_cI_a$	49.0	8.35	0.79	9.86	222.00	234.15	71.22	33.30	3.61
$P_dZn_aI_a$	48.5	7.98	1.03	9.32	247.89	210.95	53.47	34.10	3.39

$P_dZn_bI_a$	49.0	8.17	1.01	9.55	241.52	216.25	57.23	33.50	3.53
$P_dZn_cI_a$	52.5	8.43	1.01	9.68	214.00	225.05	65.08	31.60	3.68
$P_aZn_aI_b$	62.0	8.08	0.95	11.11	448.57	244.30	78.77	48.00	3.53
$P_aZn_bI_b$	62.5	8.27	0.89	11.17	435.00	256.50	82.88	46.50	3.71
$P_aZn_cI_b$	63.0	8.44	0.85	11.30	394.00	263.00	84.77	38.30	3.78
$P_bZn_aI_b$	63.5	8.22	1.00	10.96	387.00	227.82	71.66	46.50	3.66
$P_bZn_bI_b$	66.5	8.48	0.94	10.99	376.00	242.80	76.92	41.74	3.83
$P_bZn_cI_b$	70.5	8.64	0.90	11.02	364.00	253.90	80.41	38.10	3.94
$P_cZn_aI_b$	68.5	9.75	1.13	10.51	356.00	223.75	64.32	44.60	3.99
$P_cZn_bI_b$	70.5	9.87	1.08	10.87	345.00	231.82	72.86	36.70	4.63
$P_cZn_cI_b$	72.0	10.01	0.96	10.97	340.50	240.90	76.93	31.05	4.71
$P_dZn_aI_b$	71.5	9.88	1.20	9.99	326.00	217.98	61.08	36.80	4.08
$P_dZn_bI_b$	72.0	9.91	1.13	10.82	324.00	221.45	66.23	35.09	4.78
$P_dZn_cI_b$	74.0	10.08	1.05	10.95	321.50	238.78	70.25	32.55	4.87
Mean	56.9	8.41	0.92	10.33	322.47	233.98	69.73	38.83	3.70
CD $_{0.05}$	*NS*	*0.12*	*0.03*	*0.18*	*11.62*	*2.14*	*2.07*	*0.71*	*0.12*

Below ground portion

Among below ground portion, maximum root length (14.5 cm) was observed in $P_dZn_cI_b$ (T_{24}) but the results were not significant as given in Table 3. Similar results were also obtained by Bhardwaj *et al*. (2020) [4, 5] who reported that length of root increased due to application of inoculation of capsicum plant with AM fungi. The maximum total N content in root was observed (3.90%) was observed in $P_dZn_cI_b$ (T_{24}) and lowest total N content in root (3.17%) was observed in $P_0Zn_0I_0$ (T_1). Kim *et al*. (2010) [14] also reported that with application of Arbuscular Mycorrhiza, total Nitrogen content in root was increased. The maximum total P content (0.52%) in three factor interaction was observed in $P_dZn_cI_b$ (T_{24}) and lowest total P content (0.23%) was observed in $P_aZn_aI_a$ (T_1). The similar findings were also reported by Kim *et al*. (2010) [14], who showed that total phosphorus content in plants was increased by 23% by application of Arbuscular Mycorrhizae. Total K content of 3.37% was observed in $P_aZn_cI_b$ (T_{15}) and lowest total K content (2.20%) was observed in $P_dZn_aI_a$ (T_{10}). Arbuscular mycorrhizae increased total potassium content in soil also observed by Maksoud *et al*. (1994) [16]. Among micronutrient content in roots, the maximum total Fe content (133.40 mg kg^{-1}) and total Cu content (29.00 mg kg^{-1}) in roots was observed in $P_aZn_aI_b$ (T_{13}) and lowest total Fe content (104.40 mg kg^{-1}) and lowest total Cu content (9.90 mg kg^{-1}) was observed in $P_dZn_cI_a$ (T_{12}). These results fall in line with the reports of Halder and Mandal (1981) [12]. A significantly higher total Mn content (133.00 mg kg^{-1}) was observed in $P_aZn_cI_b$ (T_{15}) in and lowest total Mn content (117.05 mg kg^{-1}) was observed in $P_dZn_aI_a$ (T_{10}). Decrease in the concentration of manganese in roots with increasing P and Zn application was also reported by Halder and Mandal (1981) [12]. The three way interaction as given in Table 3 revealed that maximum total Zn content (42.91 mg kg^{-1}) was observed in $P_dZn_cI_b$ (T_{24}) and lowest total Zn content (29.57 mg kg^{-1}) was observed in $P_aZn_aI_a$ (T_1). Similar results were also observed by Olsen *et al*. (1972) [22] with increase in P application, Zinc content in

Table 3: Response of distinct levels of Phosphorus, Zinc and Mycorrhizae on below ground portion (roots):

Treatments combinations	Root length (cm)	N (%)	P (%)	K (%)	Fe (mg kg^{-1})	Mn (mg kg^{-1})	Zn (mg kg^{-1})	Cu (mg kg^{-1})	Total uptake (g plant^{-1})
$P_aZn_aI_a$	8.5	3.17	0.23	2.33	125.60	120.60	29.57	20.25	0.53
$P_aZn_bI_a$	8.8	3.54	0.27	2.35	116.00	120.75	29.56	19.25	0.62
$P_aZn_cI_a$	9.2	3.73	0.31	2.41	112.30	122.45	29.97	13.70	0.66
$P_bZn_aI_a$	8.8	3.18	0.27	2.31	117.35	119.85	31.42	12.42	0.68
$P_bZn_bI_a$	9.5	3.65	0.28	2.32	115.80	119.70	31.76	11.70	0.73
$P_bZn_cI_a$	10.0	3.89	0.38	2.40	109.75	122.00	33.76	12.80	0.81
$P_cZn_aI_a$	9.2	3.24	0.34	2.25	112.00	118.60	32.02	10.25	0.75
$P_cZn_bI_a$	9.8	3.67	0.36	2.29	109.55	120.50	37.77	10.02	0.83
$P_cZn_cI_a$	10.6	3.90	0.39	2.37	109.35	121.35	39.97	9.95	0.89
$P_dZn_aI_a$	9.8	3.61	0.36	2.20	108.20	117.05	39.47	10.06	0.80
$P_dZn_bI_a$	10.5	3.67	0.39	2.24	105.75	118.44	40.52	9.96	0.89
$P_dZn_cI_a$	11.1	3.92	0.41	2.28	104.40	120.85	40.97	9.90	0.95
$P_aZn_aI_b$	10.5	3.81	0.30	2.74	133.40	129.20	31.72	29.00	0.71
$P_aZn_bI_b$	12.0	3.75	0.33	3.30	132.00	130.20	32.02	18.40	0.82
$P_aZn_cI_b$	13.3	3.76	0.38	3.37	127.10	133.00	40.42	16.20	0.89
$P_bZn_aI_b$	11.1	3.81	0.31	2.67	125.60	128.35	37.77	16.85	0.76
$P_bZn_bI_b$	12.7	3.81	0.36	3.16	122.10	128.50	39.81	16.40	0.84
$P_bZn_cI_b$	13.5	3.82	0.39	3.21	120.50	132.90	41.16	15.60	0.99
$P_cZn_aI_b$	11.4	3.81	0.35	2.46	115.30	124.00	39.65	14.30	0.78
$P_cZn_bI_b$	13.4	3.85	0.39	2.93	115.00	128.50	41.62	11.30	0.86
$P_cZn_cI_b$	13.5	3.85	0.41	3.17	112.05	131.00	42.31	10.25	1.01
$P_dZn_aI_b$	11.9	3.84	0.36	2.36	112.15	122.80	41.17	11.60	0.80
$P_dZn_bI_b$	14.4	3.89	0.42	2.68	109.50	128.00	42.16	10.75	0.88
$P_dZn_cI_b$	14.5	3.90	0.52	3.07	108.00	130.80	42.91	10.35	1.23
Mean	11.2	3.71	0.35	2.62	115.78	124.56	37.06	13.80	0.82
CD $_{0.05}$	*NS*	*0.08*	*0.02*	*0.04*	*1.53*	*1.13*	*1.52*	*0.39*	*0.08*

roots may accumulate. The higher total nutrient uptake by roots (1.23 g $plant^{-1}$) was observed in $P_dZn_cI_b$ (T_{24}) and lowest (0.53 g $plant^{-1}$) was observed in $P_aZn_aI_a$ (T_1). Similar results were also obtained by Marscher and Dell (1994). They reported that with mycorrhizal inoculation, there is increase in nutrient uptake

Soil parameters

As shown in Table 4, maximum OC (1.51%) was observed in $P_cZn_bI_b$ (T_{20}) which is statistically at par with $P_cZn_cI_b$ (T_{21}). On the other hand minimum OC (1.10%) was observed in soils of $P_aZn_aI_a$ (T_1). The interaction effect between P, Zn and mycorrhizae revealed that there is increase in organic carbon content in inoculated soil as compared to uninoculated soil. Subramaniam *et al*. (2009) [27] also observed similar findings in which they concluded that soil inoculated with AM fungi had higher organic carbon than control. Among macronutrient content in soil, maximum available Nitrogen content in soil (214.77 mg kg^{-1}) and maximum available potassium in soil (128.31mg kg^{-1}) were observed in $P_cZn_cI_b$ (T_{21}) and minimum available Nitrogen content in soil (145.50 mg kg^{-1}) and minimum available potassium (98.07 mg kg^{-1}) were observed in $P_aZn_aI_a$ (T_1). Similar findings were reported by Medina *et al*. (2004) [250]. Maximum available phosphorus content in soil (46.40 mg kg^{-1}) was observed in $P_dZn_cI_b$ (T_{24}) and minimum available phosphorus content in soil (38.01 mg kg^{-1}) was observed in $P_aZn_aI_a$ (T_1). Yusnizar and Rahmawati (2014) [30] also reported mycorrhizal inoculation and Phosphorus increased available Phosphorus in soil. Among micronutrient content in soil, maximum DTPA-Fe in soil (5.73 mg kg^{-1}), maximum DTPA-Mn in soil (2.25 mg kg^{-1}) and DTPA-Cu in soils (1.27 mg kg^{-1}) was observed in $P_cZn_cI_b$ (T_{21}) and minimum DTPA-Fe (4.90 mg kg^{-1}), DTPA-Mn (1.31 mg kg^{-1}) and DTPA- Cu (0.57 mg kg^{-1}) was observed in $P_aZn_aI_a$ (T_1). Also maximum DTPA-Zn in soil (3.55 mg kg^{-1}) was observed in $P_cZn_cI_a$ whereas, minimum DTPA-Zn (2.25 mg kg^{-1}) was observed in $P_aZn_aI_a$. The micronutrient contents in soil showed a variable distribution pattern.

Table 4: Response of distinct levels of Phosphorus, Zinc and Mycorrhizae on physico-chemical properties of soil:

Treatments combinations	Organic Carbon (%)	N (mg/kg)	P (mg/kg)	K (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Cu (mg/kg)
$P_aZn_aI_a$	1.10	145.50	38.01	98.70	4.90	1.31	2.25	0.57
$P_aZn_bI_a$	1.11	148.60	39.25	105.00	4.93	1.32	2.37	0.75
$P_aZn_cI_a$	1.11	151.17	40.50	107.50	4.97	1.39	2.50	0.83
$P_bZn_aI_a$	1.12	153.50	39.00	101.00	4.95	1.40	2.73	0.72
$P_bZn_bI_a$	1.15	157.00	39.50	103.50	4.95	1.46	2.78	0.82
$P_bZn_cI_a$	1.19	162.50	43.79	103.50	5.01	1.56	2.97	0.84
$P_cZn_aI_a$	1.25	198.43	40.70	118.00	5.26	1.88	3.45	0.97
$P_cZn_bI_a$	1.28	199.03	41.35	123.00	5.30	1.90	3.53	0.98
$P_cZn_cI_a$	1.30	201.00	43.95	125.50	5.40	1.91	3.55	0.98
$P_dZn_aI_a$	1.17	166.00	44.10	102.86	5.18	1.65	2.96	0.80
$P_dZn_bI_a$	1.19	171.50	45.80	111.41	5.18	1.76	2.98	0.86
$P_dZn_cI_a$	1.19	175.00	45.00	117.00	5.22	1.85	3.40	0.88
$P_aZn_aI_b$	1.17	158.50	39.91	114.25	5.32	1.94	2.33	0.63
$P_aZn_bI_b$	1.24	161.77	40.40	115.00	5.33	1.95	2.71	0.73
$P_aZn_cI_b$	1.26	174.00	40.55	116.50	5.53	1.96	2.85	0.83
$P_bZn_aI_b$	1.26	172.97	40.98	118.00	5.32	1.99	2.33	0.64
$P_bZn_bI_b$	1.30	177.13	44.90	120.00	5.37	1.99	2.95	0.79
$P_bZn_cI_b$	1.37	188.50	44.89	120.00	5.38	2.00	3.15	0.85
$P_cZn_aI_b$	1.48	201.67	44.35	126.50	5.48	2.15	3.21	0.86
$P_cZn_bI_b$	1.51	201.90	44.50	127.00	5.71	2.16	3.25	1.04
$P_cZn_cI_b$	1.51	214.77	44.50	128.31	5.73	2.25	4.11	1.27
$P_dZn_aI_b$	1.39	177.73	45.30	121.50	5.36	2.11	3.19	0.82
$P_dZn_bI_b$	1.40	197.00	45.70	123.00	5.58	2.11	3.21	1.04
$P_dZn_cI_b$	1.44	198.57	46.40	125.00	5.62	2.12	3.28	1.07
Mean	1.27	177.24	42.64	115.50	5.29	1.84	3.00	0.86
$CD_{0.05}$	*0.03*	*4.89*	*1.80*	*2.84*	*0.04*	*0.03*	*0.19*	*0.07*

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