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Studies on different sources and levels of potassium on post harvest characters of paprika (*Capsicum annuum* var. *longam*) cv. KtPl-19 under drip fertigation system

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SUMMARY :

Paprika (*Capsicum annuum* var.*longam*) is the Hungarian word for plants in the genus *Capsicum*, belonging to the family Solanaceae which has its origin from Western Hemisphere of the world. Fertigation is known to play a vital role in enhancing the productivity and quality of many horticultural crops. Fertigation studies on paprika (*Capsicum annuum* var. *longum*) were carried out, during 2006-2009 at Coimbatore to find out the effect of different sources and levels of potassium on post harvest characters of paprika. The treatment T_7 recorded the lowest Physiological loss in weight and fruit spoilage, the highest fruit firmness and shelf-life.

KEY WORDS : Paprika, Drip fertigation, Post harvest characters

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Natural food colourants are added to food products to impart high aesthetic appeal (Marmion, 1979), flavour, aroma (or) piquancy and colour to the foods (Srinivasan, 2000). Paprika is one of the important natural colourants next to turmeric colour extract (Anonymous, 1995). Paprika contains remarkable amount of the colouring material and is used as colourant in processed foods as they get the nod over synthetic products in the food colourant market (Prasath and Ponnuswami, 2008). Dried paprika powder and paprika oleoresin are the natural colour sources exempted from certification and can be used directly (Marmion, 1979). Synthetic colour and flavouring substances hitherto added in various food and cosmetic preparations are reported to be carcinogenic and therefore banned in many countries. This has resulted in huge demand for chilli and paprika oleoresin with high natural colourant and mild pungency. Paprika requires heavy manuring for proper growth and producing high yields (Anonymous, 1995). This warrants correct manuring practices with both organic and inorganic nutrients to get the desired growth and yield (Sharma *et al*., 1996 and Hedge, 1997). Besides, potassium improved fruit colour as well as oleoresin content in capsicum (Yodpetch, 2001). Recently use of SOP which suplies sulphur apart from K is also known to improve the growth, yield and quality of certain horticultural crops (Ananthi, 2002 in chillies). With this background, an investigation was taken up to determine the effect of certain aspects of fertigation involving

water soluble and conventional fertilizers in paprika cv. KtPl-19 with reference to post harvest characters in paprika.

EXPERIMENTAL METHODS

A field experiment was carried out at the College Orchard, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during the period from 2006 to 2009 with paprika var. Ktpl-19. The experimental field was located at 11° North latitude and 77° East longitude at an altitude of 426.6m above MSL. The soil of the experimental field was clayey loam in texture. The field experiment was laid out in a Randmized Block Design with seven treatments *viz.*, (T_1)- 100 per cent Recommended normal fertilizer applied to soil with furrow irrigation*, (T_2)-Drip fertigation with water soluble fertilizer at 50 % RDF using polyfeed + urea+ MOP**, (T_3)-Drip fertigation with water soluble fertilizer at 75 % RDF using polyfeed + urea+ MOP**, (T_4)-Drip fertigation with water soluble fertilizer at 100 % RDF using polyfeed + urea+ MOP**, (T_5)-Drip fertigation with water soluble fertilizer at 50 % RDF using MAP + Multi-K + SOP**, (T_6)-Drip fertigation with water soluble fertilizer at 75 % RDF using MAP + Multi-K + SOP**, (T_7)-Drip fertigation with water soluble fertilizer at 100 % RDF using MAP + Multi-K + SOP** (** Water soluble fertilizers = MAP (12% N and 61% P), MOP (60% K), SOP (50%K and 18% S), Multi K (13 % N and 45 % K) and Polyfeed (19 % N, 19 % P and 19 % K) and replicated thrice. The recommended dose of N: P: K @ 120:100:120 kg per hectare (Horticulture Crop production manual, TNAU, 2004) was followed in the experiments. Fertigation was scheduled on alternative days starting from second week after planting. Beds of experimental unit consisted of 19m^2 and seedlings planted with a spacing of 60 × 45 cm. The data were subjected to statistical analysis and the results are presented in Tables 1 and 2.

EXPERIMENTAL FINDINGS AND ANALYSIS

The findings of the present study as well as relevant discussion have been presented under following heads :

Post harvest characters :

Physiological loss of weight (*%*) (*Tables 1*) :

Physiological loss of weight in paprika fruit was studied on 3rd, 6th and 9th day after harvest. The results revealed that significant difference was observed between the treatments for this trait in pooled mean analysis. Significantly lower physiological loss of weight of 4.92 per cent, 13.14 per cent and 14.64 per cent on 3rd, 6th and 9th day of stage by T_7 and 5.59 per cent, 13.61 per cent and 17.11 per cent on 3rd day, 6th day and 9th day in T_6 were recorded. However, the control treatment (T_1) registered the highest per cent of physiological loss of weight on 3rd day (10.07 %), 6th day (18.41 %) and 9th day (21.56 %), respectively.

Significantly higher physiological loss of weight of 10.04 per cent and 10.11 per cent on 3rd day, 18.11 per cent and 18.20 per cent on 6th day and 21.51 per cent and 21.61 per cent on 9th day was registered by the treatment T_1 during season I and II, respectively. The treatment T_7 showed the lowest physiological loss in weight (4.69 % and 5.16 % on 3rd day, 12.69 % and 13.59 % on 6th day and 12.19 % and 17.09 % on 9th day) during season I and II, respectively. It was followed by T_6 (5.26 and 5.59 % on 3rd day, 13.16 and 14.06 % on 6th day and 16.66 and 17.56 % on 9th day of season I and II).

Fruit firmness (*N*) (*Tables 1*) :

Pooled mean analysis of fruit firmness showed that the highest value for firmness was observed by the treatment T_7 (19.46 N, 15.71 N and 11.55 N on 3rd, 6th and 9th day) and it was followed by T_6 (17.90 N, 13.65 N and 9.49 N on 3rd, 6th and 9th day). However, the lowest fruit firmness was recorded by T_1 (14.16 N, 9.90 N and 5.75 N on 3rd, 6th and 9th day).

It was observed that the fertigation treatments showed significant difference for the fruit firmness during both seasons. Drip fertigation with water soluble fertilizers at 100 per cent RDF using MAP, Multi-K and SOP recorded the highest fruit firmness of 19.45 N and 19.47 N on 3rd day and 15.24 N and 16.17 N on 6th day and 11.23 N and 11.87 N on 9th day during season I and II, respectively. It was followed by T_6 17.39 N and 18.41 N on 3rd day, 13.18 N and 14.11 N on 6th day and 9.17 N and 9.81 N on 9th day of season I and season II as the next best one. Whereas the treatment T_1 recorded the lowest fruit firmness of 13.65 N and 14.67 N on 3rd day, 9.44 N and 10.37 N on 6th day and 5.43 N and 6.07 N on 9th day of season I and II, respectively.

Shelf-life (*days*) (*Tables 2*) :

Fertigation treatments showed significant difference for the fruit shelf-life. The treatment T_7 showed the highest shelf-life of 9.03 days. It was followed by T_6 (8.20 days). Whereas, the lowest shelf-life was noticed by T_1 (6.75 days) in the pooled mean.

Similar trend was also noticed with season I and II for the trait shelf-life. The maximum shelf-life of 9.02 days and 9.04 days was observed by the treatment T_7 during season I and II. It was followed by T_6 (7.95 days and 8.45 days during season I and II). While, the control registered the minimum shelf-life of 5.78 days and 6.71 days during season I and II, respectively.

Fruit spoilage (*%*) (*Tables 2*) :

Significantly lower fruit spoilage of 10.04 per cent was noticed by T_7 and it was followed T_6 (14.77 %) on the pooled mean. While higher fruit spoilage of 36.84 per cent was noticed by T_1 (control).

With respect to seasonal mean values, the treatment T_7

Table 1 : Effect of fertigation on physiological loss in weight of fruits (%) and fruit firmness (N) of fruits in paprika cv. KtPl-19

Treatments	Physiological loss in weight of fruits (%)									Fruit firmness (N) of fruits								
	3rd day			6th day			9th day			3rd day			6th day			9th day		
	Season		Mean	Season		Mean	Season		Mean	Season		Mean	Season		Mean	Season		Mean
	I	II		I	II		I	II		I	II		I	II		I	II	
T_1	10.04	10.11	10.07	18.11	18.70	18.41	21.51	21.61	21.56	13.65	14.67	14.16	9.44	10.37	9.90	5.43	6.07	5.75
	(18.47)	(18.54)	(18.54)	(25.18)	(25.62)	(25.40)	(27.63)	(27.69)	(27.66)									
T_2	7.75	8.65	8.20	15.75	16.65	16.20	19.25	20.15	19.70	15.12	16.14	15.63	10.91	11.84	11.37	6.90	7.54	7.22
	(16.09)	(17.10)	(17.21)	(23.37)	(23.87)	(23.63)	(26.02)	(26.66)	(26.34)									
T_3	6.55	7.45	6.67	14.55	15.45	15.00	18.05	18.95	18.48	16.00	17.02	16.51	11.70	12.72	12.21	7.78	8.42	8.10
	(14.70)	(15.82)	(14.90)	(22.42)	(23.47)	(22.95)	(25.13)	(25.80)	(25.47)									
T_4	6.22	7.12	6.10	14.22	15.12	14.67	17.72	18.62	18.17	16.87	17.89	17.38	12.66	13.59	13.13	8.65	9.29	8.97
	(14.05)	(15.41)	(15.57)	(22.15)	(22.88)	(22.51)	(24.89)	(25.56)	(25.23)									
T_5	7.53	8.43	7.98	15.53	16.43	15.98	19.03	19.93	19.48	15.76	16.78	16.27	11.55	12.48	12.02	7.54	8.18	7.86
	(15.56)	(16.89)	(16.34)	(23.35)	(23.90)	(23.55)	(25.86)	(26.51)	(26.18)									
T_6	5.26	5.59	5.59	13.16	14.06	13.61	16.66	17.56	17.11	17.39	18.41	17.90	13.18	14.11	13.65	9.17	9.81	9.49
	(12.92)	(13.67)	(13.76)	(21.26)	(22.01)	(21.64)	(24.08)	(24.77)	(24.43)									
T_7	4.69	5.16	4.92	12.69	13.59	13.14	12.19	17.09	14.64	19.45	19.47	19.46	15.24	16.17	15.71	11.23	11.87	11.55
	(12.50)	(12.86)	(12.88)	(20.86)	9(21.62)	(21.25)	(20.43)	(24.41)	(22.42)									
S.E.±	0.037	0.038	0.036	0.051	0.048	0.035	0.080	0.040	0.045	0.056	0.064	0.043	0.065	0.065	0.064	0.065	0.066	0.065
C.D. (P=0.05)	0.082	0.083	0.081	0.112	0.104	0.072	0.174	0.089	0.092	0.123	0.143	0.089	0.143	0.141	0.141	0.143	0.143	0.142
C.D. (P=0.01)	0.115	0.116	0.115	0.158	0.146	0.098	0.244	0.124	0.126	0.172	0.201	0.121	0.201	0.199	0.197	0.200	0.201	0.200

*values in parenthesis are transformed values

T_1– 100% RDF applied to soil with furrow irrigation, T_2–Drip fertigation with water soluble fertilizers at 50 % RDF using polyfeed + urea+ MOP, T_3–Drip fertigation with water soluble fertilizers at 75 % RDF using polyfeed + urea+ MOP, T_4–Drip fertigation with water soluble fertilizers at 100 % RDF using polyfeed + urea+ MOP, T_5–Drip fertigation with water soluble fertilizers at 50 % RDF using MAP + Multi-K + SOP, T_6 Drip fertigation with water soluble fertilizers at 75 % RDF using MAP + Multi-K + SOP, T_7 Drip fertigation with water soluble fertilizers at 100 % RDF using MAP+ Multi-K + SOP

Table 2 : Effect of fertigation on shelf- life of fruits (days) and fruit spoilage (%) on 9th day in paprika cv. KtPl-19

Treatments	Shelf-life of fruits (days)			Fruit spoilage (%) on 9th day		
	Season		Mean	Season		Mean
	I	II		I	II	
T_1	5.78	6.71	6.75	36.55 (37.19)	37.13 (37.54)	36.84 (37.36)
T_2	7.23	7.73	7.48	30.65 (33.61)	31.04 (33.80)	30.84 (33.70)
T_3	7.14	7.64	7.39	23.73 (29.15)	23.89 (29.25)	23.80 (29.20)
T_4	7.29	8.05	7.55	17.17 (24.48)	17.22 (24.51)	17.19 (24.49)
T_5	7.05	7.79	7.54	26.40 (30.91)	26.66 (31.08)	26.53 (30.99)
T_6	7.95	8.45	8.20	14.71 (22.55)	14.83 (22.64)	14.77 (22.59)
T_7	9.02	9.04	9.03	9.91 (18.35)	10.18 (18.60)	10.04 (18.47)
S.E. ±	0.035	0.026	0.022	0.234	0.236	0.166
C.D. (P=0.05)	0.076	0.057	0.044	0.511	0.515	0.343
C.D. (P=0.01)	0.106	0.080	0.061	0.718	0.723	0.466

*values in parenthesis are transformed values

T_1–100% RDF applied to soil with furrow irrigation, T_2–Drip fertigation with water soluble fertilizers at 50 % RDF using polyfeed + urea+ MOP, T_3–Drip fertigation with water soluble fertilizers at 75 % RDF using polyfeed + urea+ MOP, T_4–Drip fertigation with water soluble fertilizers at 100 % RDF using polyfeed + urea+ MOP, T_5–Drip fertigation with water soluble fertilizers at 50 % RDF using MAP + Multi-K + SOP, T_6–Drip fertigation with water soluble fertilizers at 75 % RDF using MAP + Multi-K + SOP, T_7–Drip fertigation with water soluble fertilizers at 100 % RDF using MAP+ Multi-K + SOP

recorded the lowest fruit spoilage of 9.91 per cent and 10.18 per cent during season I and II and it was followed by T_6 (14.71 % and 14.83 % during season I and II). However the highest fruit spoilage to the tune of 36.55 per cent and 37.13 per cent was recorded by T_1 (control) during both season I and II.

Effect of fertigation on post harvest characters :

In the present study, though the storage losses in the fruits did not show any significant variations among the treatments, however the treatments having 100 per cent RDF as SOP, MAP and Multi-K registered less Physiological loss of weight (%) and fruit spoilage. This finding was in confirmation with Ansary *et al*. (2006) in onion who stated that low nitrogen treatments along with improved production techniques could give higher levels of sprouting resistance to onion bulbs. Grevsen and Sorensen (2004) in bulb onion also reported similar findings.

Among the systems of fertilization, drip fertigation (application of 100 % RDF as SOP, MAP and Multi-K) resulted with higher fruit firmness and shelf-life. Since calcium is having predominant role in increased firmness and shelf-life of fruits, the relationship between K and Ca and their ratio is also plays a key role here. Furthur, the extended shelf-life of fruits under treatments having 'K' could be explained through the role of potassium in importing resistance to biotic factors, more specifically suppression of post harvest disease (anthracnose) caused by *Colletrotricum capsicii* in paprika. Further, the fungicidal property of sulphur present in SOP can also be ascribed to extended shelf-life which could have been useful in delaying the fungal invasion during post harvest stage this was in agreement with Usherwood (1985). Similar work related to the present investigation was also carried out by Weissenberg *et al*. (1997); Kannan *et al.* (2009); Revanappa (1993) worked on the response of green chilli genotypes to nitrogen levels, plant density and growth levels. Sathish *et al*. (2012) worked on the high performance liquid chromotagraphic separation of capsanthin content of paprika under drip fertigation system and Singh *et al*. (1990) worked on the performance of chilli under tarai regions of U.P.

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