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Yield of *kachri* (*Cucumis callosus*) as influenced by organic and inorganic sources of nutrients in arid zone

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To achieve nutrition and income security for the people, particularly in hot arid region of north-western parts of Rajasthan, suitable crop-plant species from vegetables are of vital importance. The native crops like *kachri* (*Cucumis callosus*) support livelihood in the hostile situations, where vegetable crop diversification is not much feasible. However, limited attention was paid for its nutrient management and other crop production aspects. *Kachri* requires hot and dry climate and a long growing season preferably with warmer days for cultivation both as rainy and summer season crop. The high temperature and dryness conditions are beneficial for crop, fruit maturity and quality and are also best for dehydration of *kachri* fruits.

Indiscriminate use of macro-nutrients may affect uptake of nutrients (Kumar and Babel 2011). Plants take their nutrients mostly from soil for the optimum plant growth and crop yield depends not only on the total amount of nutrients present in the soil at a particular time but also on their availability which is controlled by soil texture, organic carbon and calcium carbonate, cation exchange capacity, pH and electrical conductivity of soil. The crop production in the hot arid regions are constrained by low and erratic rainfall (100-420 mm/year), high evapo-transpiration (1 500-2 000 mm/year) and adverse soil physical and fertility conditions. Arid region of Rajasthan, having the problem of sand dunes which are characterized by light texture, low organic carbon content, high pH, low CEC and salinity/ alkalinity problems (Shyampura *et al.* 2002). These soil conditions are not favourable for adequate availability of macro and micronutrients (Chattopadhyay *et al*. 1997, Singh 2006, Singh 2008, Yadav and Meena 2009, Rathore 2009, Yadav 2011). The low organic matter has been attributed to high temperature, low rainfall, scanty vegetation cover and single grained texture of soil.

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Fertilizers constitute 18-22% costs of cultivation in *kachri*. Fertilizer costs are rising every year, therefore, it is important to maximize use of locally available organic nutrient sources to maintain the soil fertility and productivity. The use of inorganic fertilizer in conjunction with organic manures is essential for getting sustainable and profitable yield of *kachri*. Since, the application of inorganic fertilizers alone could not sustain the soil fertility and productivity under cropping sequences, thus the only way to realize the potential yield of crops on sustained basis is through use of various sources of nutrients in integrated manner to make the system productivity profitable (Jatav *et al.* 2009, 2015) .

Nutrients requirement of *kachri* differ with soil, climate, cultivar and growth period. Nutrients use efficiency is low in *kachri* in the hot arid region. So, there is a need to develop nutrient management techniques. Integrated Nutrient Management (INM) implies the most efficient use and management of organic and inorganic sources of nutrients to attain higher levels of *kachri* productivity along with maintaining the fertility of the soil. Research works on INM system for *kachri* crop is scanty. However, information on response of nutrient has not been generated so far. Therefore, a field experiment was conducted at ICAR-CIAH research farm with *kachri* cultivar AHK119 during 2014-15 in the *kharif* season to investigate the role of application of inorganic and FYM source of nutrient on *kachri* performance. The soil was sandy, alkaline in reaction with pH 8.3, organic carbon 0.12%, available N 106 kg/ha, available P 11 kg/ha and available K 310 kg/ha. The six manurial treatments consisted of control, 100% NPK from inorganic fertilizers, 75% (I)+7.5 tonnes/ha FYM, 50%(I)+ 15 tonnes/ha FYM, 25% (I)+ 22.5 tonnes/ha FYM and 30 tonnes/ha FYM were replicated three times in a randomized block design. *Kachari* variety AHK-119 was sown with hand plough at Spacing 3m × 50cm row-to-row and plant to plant distance. The recommended dose of fertilizer was 80 kg N+40 kg of P_2O_2 +40 K_2O /ha was applied and P_2O_2 and 40 K_2O was given as basal dose through single superphosphate and muriate of potash. Nitrogen dose was

applied in three splits, i.e. 1/3rd at sowing, 1/3rd at 25 DAS and rest 1/3rd 50 DAS from fertilizers and FYM was applied as per treatment in furrows (channel technology) at the sowing time.

For working out net return from *kachri*, price of *kachri* was taken as ₹ 2 000/q. Percent yield response was computed as follows.

$$\text{Yield response: } \frac{\text{Yield in fertilized plot} - \text{Yield in unfertilized plot}}{\text{Yield in unfertilized plot}}$$

The application of organic and inorganic sources of nutrients significantly increased yield of *kachri* as compared to control (Table 1). Integration of organic and inorganic sources at equal proportion (application of 50% NPK from inorganic fertilizers and 15 tonnes/ha FYM) gave the highest *kachri* yield (113.08 q/ha) which was significantly higher than all other treatments. The increase in total yield was 26.77% higher over recommended NPK through fertilizers. Application of 100% NPK through FYM also increased yield significantly by 32.71% compared to control. Whereas, this treatment gave only 5.12% more fruit yield as compared to recommended dose of fertilizers. Other treatments, where 25, 75 or 100% of NPK were applied through organic sources were better than control, but were inferior to 50% replacement and *at par* among treatments. In dry matter yield (q/ha), dry matter (%), average weight of fruit (kg) and fruit yield was same trend as observed in yield.

Maximum per cent yield response was observed where 50% (I)+ 15 tonnes/ha FYM was applied (64.57%) followed by 75% (I)+7.5 tonnes/ha FYM (54.37%) as compared to control (Fig.1). This may be due to more partitioning of dry matter to *kachri* as a result of balance nutrition in the treatment receiving FYM application. Similar results were reported by Jatav *et al.* (2009), (2015).

Net return and benefit cost ratio of the kachri

Net return from *kachri* followed similar trend (Table 2)

Table 1 Effect of organic and inorganic source of nutrient on yield performance of *kachri*

Treatments	Yield (q/ha)	Average weight of fruit (g)	Dry matter (%)	Dry matter yield (q/ha)
Control	68.71	26.13	8.16	5.60
100% (I)	87.89	34.06	8.69	7.64
75% (I)+7.5 t/ha FYM	104.00	36.25	8.79	9.15
50% (I)+ 15 t/ha FYM	113.08	38.78	9.81	11.09
25% (I)+ 22.5 t/ha FYM	93.27	37.00	9.98	9.31
30 t/ha FYM	91.19	34.78	8.99	8.19
SEm+	4.86	1.98	0.4	0.46
CD (P=0.05)	14.88	6.03	1.29	1.44

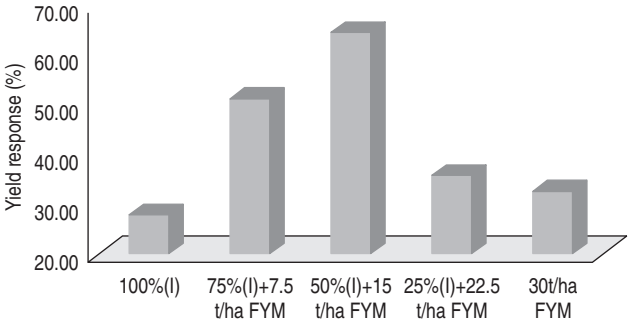

Fig 1 Role of organic and inorganic source of nutrient on yield response (%) of *kachri*

Table 2 Net return and B:C ratio under treatments

Treatments	Yield (q/ha)	Cost of cultivation (₹/ ha)	Gross return (₹)	Net return (₹/ha)	B:C ratio
Control	68.71	33000	137429	104429	3.16
100% (I)	87.89	37073	175770	138697	3.74
75% (I)+7.5 t/ha FYM	104.00	37255	208008	170753	4.58
50%(I)+ 15 t/ha FYM	113.08	37437	226152	188715	5.04
25%(I)+ 22.5 t/ha FYM	93.27	37618	186533	148914	3.96
30 t/ha FYM	91.19	37800	182377	144577	3.82

as that of fruit yield with highest values of ₹ 188 715/ha was observed in 75% inorganic NPK + 15 tonnes/ha FYM treatment. This was closely followed by 75% NPK+ 7.5 tonnes/ha FYM (₹ 170 753/ha) and 25% inorganic NPK along with 22.5 tonnes/ha FYM (₹ 148 914/ha). FYM application gave net return of ₹ 144 577/ha as compared control (₹ 104 429/ha). The benefit : cost ratio was highest in the treatment receiving 75% inorganic NPK + 15 tonnes/ha FYM (5.04) closely followed by 75% NPK+ 7.5 tonnes/ha FYM treatments (4.58), whereas control gave the lowest B:C ratio (3.16).

The duration of *kachri* is longer and for increased duration of nutrients supply, right proportion of inorganic and organic source is required to meet nutrients supply throughout the crop growth and fruiting period. At this proportion inorganic sources maintained the availability of nutrients at a rate at which crop did not suffer stress. At the same time organic sources maintained the balance nutrition to crop for a longer duration. This proportion also favored mineralization of organic source at desirable rate to maintain supply of nutrients not only to *kachri* crop.

SUMMARY

The results showed that under hot arid agro-climate where soil is low in organic matter and available plant nutrients are of great importance in increasing yield by the balanced plant nutrients supply in *Kachri* (*Cucumis callosus*). It may concluded that combined application of

50% recommended dose of NPK (40 kg N+20 kg of P_2O_2 +20 K_2O) along with 15 tonnes/ha FYM (in channel) gave higher yield (113.08 q/ha). Besides more yield, this treatment also showed increasing efficiency, net return and B: C ratio.

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