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Varietal evaluation of vegetable cowpea (*Vigna unguiculata* (L.) walp) with respect to yield under North Gujarat condition

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Abstract
A field experiment was conducted at Horticulture Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University, Gujarat during *zaid* season 2014. The investigation comprising ten varieties *viz.*, Anand Vegetable Cowpea-1, Dantiwada Vegetable Cowpea-2, Kashi Shyamal, Kashi Gauri, Kashi Unnati, Kashi Kanchan, Kashi Nidhi, Arka Garima, Arka Suman and Arka Samridhi were tested in the Randomized Block Design with three replications. Varieties were evaluated on the basis of Yield parameters of cowpea. Almost all yield parameters were significantly influenced by treatments. Treatment V7 (Kashi Nidhi) was found superior with respect to maximum green pod yield per plant (262.51g), yield per plot (4.200 kg), yield per hectare (155.54 q), Whereas, treatment V10 (Arka Samridhi) was found superior with respect to number of pods per plant (64.66). To achieve higher yield and maximum return, cowpea variety Kashi Nidhi is superior.

Keywords: cowpea, RBD, varietal evaluation, AVC-1, DVCP-2

Introduction
Vegetables play a vital role in the health and nutritional security of human being to improve the economy of the farming community. The productivity of the vegetables per unit area is much higher than the cereals. Being short duration crops, vegetables fit well in the multiple cropping systems. Vegetables farming because of its labour intensive nature offers more employment opportunities. India best towed with diverse climatic conditions is most suitable for growing tropical, subtropical and temperate types of vegetables. The vegetable improvement work in India, initiated nearly four decades ago, resulted in the development of a large number of varieties. There are still some vegetables, which have great potential and cowpea is one of them. Cowpea (*Vigna unguiculata* (L.) Walp) is an important leguminous crop is believed to be originated in Central Africa. It is self pollinated annual herb with a wide range of growth habit and response to photoperiod. In country, it is cultivated mainly in Gujarat, West Bengal, Tamil Nadu, Andhra Pradesh, Kerala and Orissa. In Gujarat, it is mainly grow in Sabarkantha, Banaskantha, Mehasana, Patan, Ahemdabad, Kheda and Anand district and commonly known as "chowli" in this area. In India, the total area under beans cultivation is about 136 (000 ha) with the production 1373 (000 MT) (Anonymous, 2014-2015). Cowpea is nutritive vegetable. It is also known as vegetable meet. Tender marketable pods contain 83.3 per cent moisture, 3.5 per cent protein, 2.0 per cent fiber, 8.1 per cent carbohydrates, 0.09 per cent mineral matter, 0.5 per cent niacin and 14.0 mg vitamin-C per 100 gm of edible pods. On dry weight basis cowpea grain contain 23.4 per cent protein, 1.3 per cent fat and 60.3 per cent carbohydrates (Gopalkrishnan, 2007). Cowpea is used as culinary purpose. At its very first stage, the green cowpeas are savored like a green vegetable dish by individuals all over the world. It may also be used as canned or frozen. The mature as well as dry cowpeas may also be soaked and prepared like a main dish or are usually utilized as salad fillings. Cowpeas are traditionally used just as one ingredient and also flavor booster in a number of dishes. In Tamil Nadu between the Tamil months of Maasi (February) and Panguni (March), a cake like dish called Kozhukattai is prepared with cooked and meshed cowpeas mix with jaggery, ghee and other ingredients. Immature pods of cowpea are used in the same way as most other beans, often the pods are stired, fried or mixed with other vegetables. Green cowpea grains are boiled as a fresh vegetable or may be canned or frozen.
Cowpea is shallow rooted crop and grown well under low fertile soil and low moisture condition. Thus, it has multipurpose uses and has wide range of adaptability to agro-climatic conditions, prevailing in India. Mostly, cowpea is grown in warm and kharif season in India and often cultivated as intercrop. It is more remunerative with other crops with some saving of fertilizers for higher and profitable yield. It can fix atmospheric nitrogen in the soil by their

symbiotic relationship with a specific soil bacteria (Rhizobium spp.). Rhizobium makes atmospheric nitrogen available to the plant by process of nitrogen fixation in their root nodules and thus help for making agriculture more sustainable.

In India, despite the fact that a large number of varieties and agro-techniques have been developed, the productivity of cowpea has still not reached the optimum level. So, there is urgent need to evaluate the cowpea varieties released from states and national levels and made a certain recommendation to generate research evidences of different varieties with respect to their suitability under certain conditions to benefits the cowpea growers of North Gujarat.

Review of literature

In recent years a number of investigations have been reported towards ways and means for qualitative and quantitative improvement of crops. Among the various tools applied for betterment of the crops, methods of cultivation and plant population per unit area have been important factors for high yield of any crop. The aim of vegetable research is to increase the production per unit area by judicious use of inputs and management practices without deteriorating the soil fertility. Hence, it is required to ascertain the optimum levels for irrigation, nutrients, spacing, suitable variety and plant protection measures. Among them variety to be more important. Considerable amount of work on these aspects with regard to evaluation of various varieties of cowpea carried out in different parts of India and abroad but in this region there is no information with respect to varieties available on state and national level. Therefore, to generate the data on suitability of various varieties of cowpea for vegetable purpose, the present investigation was undertaken to see the performance of various varieties of cowpea with respect to growth yield and quality under North Gujarat condition.

Responses of varieties on yield parameters

Kalloo *et al*., (2005) [6] reported that vegetable pea varieties VR-6, VR-7 and VR-22 have significantly maximum pod weight (10g), pod length (10.1cm) and seed per pod (9.4) respectively. Whereas, the VR-8 and VR-10 was produced significantly maximum pods per plant (18) and pod yield per plant (123.5gm) respectively.

Thakor (2008) [14] revealed that garden pea variety Bonneville was found superior with respect to yield of green pods per plot (3.320kg) and yield per hectare (9224.53kg) in comparison to other varieties under experiment

Futuless *et al*., (2010) [4] observed that cowpea varieties White Kananado and Brown Kananado were recorded significanlty highest yield of 19,012.10 kg/ha and 20,000.20 kg/ha respectively in comparison to other varieties under experiment. The yield range from 14,000.30 kg/ha to 20,000.20 kg/ha.

Sarangi and De (2010) [10] revealed that French bean variety contender was found superior in yield parameters with respect to pod yield (747.92 g/m) and number of pods (111.97 per m2).

Singh and Singh (2011) [12] indicate that garden pea variety Kashi Mukti produced significantly maximum number of pods per plant (7.67) and number of seed per pod (6.59) whereas, Kashi Nandini produced boldest seed as evident by its 100 seed weight (24.74gm), which was found significantly higher than the 100 seed weight of other variety under experiment. Maximum seed yield (10.6q/ha) was noted under variety Kashi Udai.

Lal and Rai (2011) reported that cowpea variety KVCP-2 was performed superior in yield parameters with respect to pods per plant (15.8), pod weight (11gm) and pod yield per plant (167.93gm).

Patel *et al*., (2011) conducted the field experiment on effect of different plant spacing and varieties on yield parameters of cowpea. Among all the varieties, GC-3 was found superior with respect to yield parameters.

Kumar *et al*., (2012) reported that cluster bean cultivar HG 2-20 was performed superior with respect to yield parameters.

Chadha *et al*., (2013) revealed that significantly maximum pod yield per hectare (108.58 q/ha) was observed in EC538008 it was statistically at par with two standard checks viz., Palam Priya (85.24q/ha) and Punjab-89(91.12q/ha) varieties of garden pea while significantly, maximum pods per plant (12.27), pod yield per plant (52.13gm) were observed in EC538008.

Bhushan *et al*., (2013) concluded that genotype CPS-05-03 have significantly maximum no. of pods per plant (48.5). The garden pea cultivar P-89 and Arkel were found superior with respect to pod weight per plant (198.3gm) and yield per hectare (223.8 q) respectively.

Sharma *et al*., (2013) reported that significantly maximum pod length (9.86cm) and seed per pod (8.98) were observed in garden pea variety Pb-89. Whereas, significantly maximum seed yield was noted under Palam Priya (28.23q/ha).

Amin *et al*., (2014) revealed that cowpea varieties Pusa Phalguni and AVCP-1 was produced significantly maximum pods per plant (56) and pod length (14.9cm). Whereas, variety JDNVC-74 was found superior with respect green pod yield per hectare (103.5q/ha).

Materials and Methods

The experiment was conducted at Horticulture Instructional Farm, College of Horticulture, S. D. Agricultural University Sardarkrushinagar, Dist. Banaskantha, Gujarat in the year 2014−15 to study the Varietal Evaluation of Vegetable Cowpea (*Vigna unguiculata* (L.) Walp) with respect to yield under North Gujarat condition. The experimental area was medium high land and the soil was sandy to clay loam. Ten varieries *viz*., AVC-1(V1), DVCP-2(V2), Kashi Shyamal(V3), Kashi Gauri(V4), Kashi Unnati(V5), Kashi Kanchan(V6), Kashi Nidhi(V7), Arka Garima(V8), Arka Suman(V9) and Arka Samridhi(V10) were collected from AAU, SDAU, IIVR and IIHR were tested in a Randomized Block Design with three replications was considered for this study as a test material. Four tones of vermicompost, 20 kg N, 40 kg P_2O_5 were applied in furrow before sowing of seed. Required quantity of seeds of all the ten varieties was weighed separately for all the experimental plots. The seeds were put into bowl and culture solution was mixed at the rate of 25 gm/kg for proper coating. After drying in shade, the seeds were used for sowing. Seeds were sown to a depth of 4 to 5 cm and sowing was done on 22 February, 2014 by dibbling the seeds in the rows which were prepared by sickle before sowing. The seeds were covered properly with the soil. A light irrigation was given immediately after sowing for better germination and then subsequent irrigations were given at morning for about 30 minutes and evening for about 1 hour daily to maintain sufficient moisture in the soil. The following parameters were studied: Yield and Yield Attributes traits viz. Number of pods harvested per plant, Yield of green pods per plant (g), Yield of green pods per plot (kg), Yield of green

pods per hectare (q). The data collected were analyzed using Fisher's analysis of variance technique and differences among the various treatments were determined by using least significant difference test at 5% probability level (Steel and Torrie, 1984) [13]. The green marketable pods of cowpea from the border line were picked up first and kept aside. Later on the pods from five selected plants under observations were picked, weighted and counted. Finally, the pods from the net plants were also picked and weighted separately. The green pods of cowpea were picked up continuously at interval of 3-4 days after first picking.

Results and Discussion

Data on number of pods per plant recorded from different treatments are summarized in table. Significantly maximum number of pods per plant (64.66) was observed with treatment V10 (Arka Samridhi) and it was statistically at par with treatment V6 (Kashi Kanchan) (60.73), treatment V7 (Kashi Nidhi) (60.40), treatment V9 (Arka Suman) (59.33) and treatment V2 (Dantiwada Vegetable Cowpea-2) (59.06). These results are in line of the findings reported by Amin *et al.,* (2014), Patel *et al.,* (2011) [9] in cowpea, Kumar and Kohali (2001) in garden pea and Bhushan *et al.*,(2013) in garden pea. Higher yield per plant (262.51 g) was observed under treatment V7 (Kashi Nidhi) and it was statistically at par with treatment V6 (Kashi Kanchan) (250.96 g). These result corroborate with the findings of Singh (2000) in clusterbean, Sarangi and De (2010) [10] and Ramana *et al.,* (2011) in french bean, Lal and Rai (2011) [8], Patel *et al.,* (2011) [9] and Amin *et al.,* (2014) in cowpea and Singhal *et al.,* (2014) in cluster bean. Higher yield per plot (4.200 kg) was observed under treatment V7 (Kashi Nidhi) and it was statistically at par with treatment V6 (Kashi Kanchan) (4.015 kg). These result corroborate with the findings of Singh (2000) in clusterbean, Sarangi and De (2010) [10] and Ramana *et al.,* (2011) in French bean, Lal and Rai (2011) [8], Patel *et al.,* (2011) [9] and Amin *et al.,* (2014) in cowpea and Singhal *et al.,* (2014) in clustrbean. Higher yield of green pod (155.54 q/ha) was recorded with treatment V7 (Kashi Nidhi) and it was statistically at par with treatment V6 (Kashi Kanchan) (148.69 q/ha). These result is corroborate with the findings of Singh (2000) in cluster bean, Sarangi and De (2010) [10] and Ramana *et al.,* (2011) in French bean, Lal and Rai (2011) [8], Patel *et al.,* (2011) [9] and Amin *et al.,* (2014) [1] in cowpea and Singhal *et al.,* (2014) in clusterbean.

The difference in number of pods per plant, yield of green pod per plant (g), yield of green pod per plot (kg) and yield of green pod per hectare (q) may be due to its inherent genetic set up, suitability of climate, atmospheric condition and soil conditions of this region.

Performance of different varieties on number of pods per plant, yield of green pod per plant (g), yield of green pod per plot (kg) and yield of green pod per hectare (q)

Treatments (Varieties)	Number of pods/plant	Yield of green pods/plant (g)	Yield of green pods/plot (kg)	Yield of green pods/ha (q)
v1	53	183.45	2.935	108.69
v2	59.06	203.51	3.256	120.57
v3	39.73	159.35	2.549	94.41
v4	51.66	221.77	3.548	131.41
v5	54.86	228.22	3.651	135.21
v6	60.73	250.96	4.015	148.69
v7	60.40	262.51	4.200	155.54
v8	32.33	142.91	2.286	84.66
v9	59.33	216.05	3.457	128.02
v10	64.66	221.43	3.543	131.20
S.Em.±	2.39	8.75	0.14	5.19
C.D. at 5%	7.12	26.01	0.42	15.42
C.V.%	7.75	7.25	7.26	7.26

Summary and Conclusion

Significantly maximum number of green pods (64.66) per plant was recorded with treatment V10 (Arka Samridhi) and treatment V7 (Kashi Nidhi) was recorded significantly maximum yield of green pod per plant (262.51g), yield per plot (4.200 kg) and yield per hectare (155.54 q).

To achieve higher yield and maximum return, cowpea variety Kashi Nidhi is superior but it is statistically at par with variety Kashi Kanchan. On the basis of above facts, it may be concluded that, for benefits of the farmer and retailers as well as health benefits of consumers, the variety Kashi kanchan is most remunerative and beneficial.

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