up faster growth and smother weeds effectively. The additional weeding at 60 days after sowing left the crops with negligible competition from weeds, resulting in significantly higher mean grain yield (14.8 q/ha) as compared to the weeding done only at 60 days after sowing (11.2 q/ha).

Delaying weeding to 60 days after sowing caused more grain yield reduction in groundnut and blackgram (37 and 20%, respectively) than than in cowpea (17%), when compared to weeding at 40 and 60 days after sowing. The lower grain yield reduction in cowpea was mainly due to its better weed suppressing ability as reported by Sar *et al.* (1978).

Better weed smothering ability coupled with shorter duration and ability to retain normal yield level even under delayed and reduced weeding makes cowpea a preferential kharif crop in multiple cropping systems of transitional tract like Dharwad, where heavy rains during July and August cause severe hinderance to weeding and intercultivation operations in the early stages of crop growth. Cowpea can also be included as an intercrop with maize or jowar due to its ability to replace one hand seeding without affecting the main crop yield(Shetty and Rao, 1979).

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Performance of Onion Varieties on Black Soils

Onion (*Allium cepa* L.) is one of the important world wide vegetable and spice crops belonging to the family "*Amarylliadaceae*". In India, it is grown in 2.6 lakh hectares, with a production of 2.7 million tonnes and the productivity is 8.5 tonnes per hectare, which is very low. It is mainly grown in the states of Maharastra, Orissa, Karnataka, Uttar Pradesh, Gujarat, Tamilnadu and Madhya Pradesh. Karnataka alone occupies an area of 0.38 lakh hectares with a production of 0.18 million tonnes and the average yield is only 4.7 tonnes per hectare (Anon., 1988), which is very low as compared to national average.

In Karnataka, onion is mainly grown in Bijapur, Bellary, Bangalore, Raichur and other districts. Yield of onion is always dependent on

use of high yielding varieties, optimum use of fertilizers, use of plant protection measures and adaptability of a variety to a particular region. Area under onion in Bellary and Raichur districts is dominated by Bellary red variety. Besides, several other varieties are also grown. Studies on fertilizer requirement of onion were carried out by Chowdappan (1972) and Narayana Reddy and Madalageri (1978). However, studies on performance of onion varieties suited to this region are meagre. Keeping this in view, a study on performance of different onion varieties on black soils was carried out at the Agricultural Research Station, Gangavati during 1989-90.

The experiment was conducted under irrigated conditions with five treatments *viz.*, Nabapur local (white), N-2-4-1, N-53, FB-780 and Bellary red varieties and four replications. The soil was black clay with PH ranging from 8.5 to 9.0 (Table 1). The seeds of different onion varieties were sown in first week of September in the nursery to raise the seedlings and after six weeks, seedlings were transplanted in third week of October into the main field. Before transplanting, fertilizers were applied at the rate of 62.5 kg. N, 50 kg P_2O_5 and 137.5 kg K_2O/ha, while 62.5 kg N/ha was applied as top dressing after thirty days of transplanting. The seedlings were transplanted with the spacing of 15 cm x 7.5 cm. Periodical plant protection measures were taken-up against pests and diseases. The crop was harvested after maturity. Observations on bulb yield, bulb weight and total soluble solids (TSS) of bulb juice were recorded.

Table 1. Soil characteristics of the experimental site

Sl. No.	Soil properties	Magnitude/ Range
1.	Mechanical analysis (%) :	
	a. Sand	29.6
	b. Silt	19.9
	c. Clay	50.5
2.	Textural class	Clay
3.	PH2 (1 : 2 Soil : Water Suspension)	8.5 - 9.0
4.	ECe (dS/m)	0.90 - 3.40
5.	Calcium carbonate (%)	10.22 - 11.18
6.	Organic carbon (%)	0.25
7.	Nutrient status:	
	a. Available N (Kg/ha)	336 - 364
	b. Available P_2O_5 (Kg/ha)	16.8 - 22.4
	c. Available K_2O (Kg/ha)	282 - 300

The data on bulb yield (Table 2) revealed that higher yield was obtained (29.9 t/ha) from N -53 which was significantly superior to Bellary red (18.2 t/ha) and Nabapur local (14.8 t/ha). However, the varieties FB-780 (24.4 t/ha) and N-2-41 (22.8 t/ha) were on par with N-53. Highest bulb weight (76 g) was recorded in N-53, which was found to be significantly superior to other varieties. Total soluble solids in juice was highest (18.30%) in Nabapur local (white) and it was significantly higher as compared to other varieties, while the lowest TSS (12.73%) was found in N-53.

Table 2. Bulb yield, bulb weight and total soluble solids of bulb juice of different varieties of onion

Treatments	Bulb yield (t/ha)	Bulb weight (g)	Total soluble solids (%)
T1 Nabapur local (white)	14.8	37.7	18.30
T2 N-2-4-1	22.8	53.2	14.75
T3 N-53	29.9	76.0	12.73
T4 FB-780	24.4	58.5	13.18
T5 Bellary red	18.2	49.0	14.95
S. Em±.	3.10	4.98	0.46
C.D. at 5%	9.50	15.37	1.61

The above results indicated a negative relationship between bulb yield and TSS of juice. Eventhough N-53 recorded highest yield, it had

lowest TSS, whereas Nabapur local (white) and Bellary red recorded low yield with high TSS compared to N-53. Considering both bulb yield and TSS, N-2-4-1 can be a suitable variety in place of Bellary red.

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A Note on Chemical Control of Cowpea (*Vigna uniquiculata* (L.) Walp.) Pod Borer Complex.

Cowpea is subjected to severe infestation by the pod borer complex involving *Maruca testulalis* (Geyer) *Cydia ptychora* (meyrick) and *Lampides boeticus* Linn.

The efficiency of six different insecticides in controlling the cowpea pod borer complex was tested by laying out a replicated trial in RBD. Each plot measured 3.0 x 2.7 meters. Cowpea variety C-152 was sown with a spacing of 4.5 x 10 cm during second week of July.

Single application of four insecticides in different formulation as detailed in the table was made during the pod initiation stage. The efficacy of treatments was assessed based on larval population, pod damage on five plants selected at random from each tratement and grain yield.

Data presented in the table indicate that the percentage of pod damage was significantly least in monocrotophos spray (21.55%) as compared to tother treatments except in endosulfan spray (28.85%) and malathion spray (42.8%) which were on par with each other. These were followed by endosulfan dust (60.12%), neem oil spray (73.88%), malathion dust (83.19%) and untreated check (90.66%).

Lowest population of spotted pod borer, *Maruca testulalis* Geyer was found in monocrotophos spray (2.33) which was significantly superior to all other treatments. Endosulfan spray and dust, malathion spray, and neem oil spray were equal in their effectiveness. Malathion dust (6.33) was significantly inferior to monocrotophos and endosulfan spray. Untreated check recorded significantly highest (10.6) larval population.

The lowest larval population of *Cydia ptychora* Meyrick was found in monocrotophos