Influence of Shelterbelt-Distance on Productivity of Pearl Millet (*Pennisetum glaucum*) in Arid Area of Bauchi, Nigeria

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ABSTRACT-*Field experiments were conducted in the shelterbelt plantation located at Azare, northern part of Bauchi State (Latitude 11^{o}40' N, Longitude 10^{o}10'E, 609. 45m above sea level) in the Sudan savanna ecological zone of Nigeria during the 2003, 2004 and 2005 raining seasons. The objective of the study was to determine the appropriate planting distance from the shelterbelt for maximum growth and yield of pearl millet. Millet Gero variety an early maturing was used in all the three years of experiment. Treatments consisted of six distances (-5, 5, 15, 25, 35 and 45m) from the shelterbelt. These treatments were arranged both at the leeward and windward sides of the shelterbelt in a randomized complete block design with four replications. Treatments perpendiculars to the shelter on the windward side of the belt serve as the control, out of which one, randomly picked was designated as -5m. Results after data analysis, showed that distance significantly (P = 0.05) influenced the growth attributes and grain yield of millet. Close (5 - 15m) to the shelterbelt, plant height, number of leaves, number of tillers and grain yield were reduced. The result also showed that these parameters increased significantly (P = 0.05) with sowing at 25m- distance. Beyond 25m however, these measured growth and yield parameters declines as the influence of the shelterbelt diminishes. Of all the distances studied, maximum growth and yield of millet was obtained at 25m-distance. It is therefore recommended to farming communities in the study area.*

Keywords: Shelterbelt- distance, productivity, millet, arid-land

1. INTRODUCTION

The biggest challenge arid-lands face is environmental degradation aggravated by poverty, which in turn accelerates the environmental degradation process itself (Chadhokar, 1988). Environmental degradation coupled with the removal of forest and vegetation cover due to increased human population pressure is responsible for the decline of land productivity in many areas (Beets, 1989; Skoupy, 1991). However, in arid-lands livestock rearing and agricultural subsistence are the major stay of the economy (Shankarnarayan *et al*., 1987). They also bear a particular force in hastening the land degradation process (Baumer, 1990). This is because in addition to the negative effect of shifting cultivation, traditional practices of animal husbandry are based on keeping large number of stock and free access to arable lands after each crop harvest. This continuous grazing with the animal number more than the carrying capacity of the land strips-off the ground cover plant and thus, leaves soil bare. Hence, soil easily becomes vulnerable to erosive winds and torrential rains (Agrawala, 1989). As a consequence, many of the arid-land areas are now characterised by food- feed- and fuelwood- deficits, erosion problems and associated declining soil fertility (Jansens, 1990; Jama *et al*., 1989).

Africa suffers from geologically induced and inherently low soil fertility as the bedrock consists of mostly granites and gneiss. African rocks are among the oldest in the world. The relationship between the parent soils and the soil forming factors are very complex because the land surface has undergone a series of shifts in vegetation and climate. Nearly one-third of the central plateau of Africa is of pre-cambrian age (over 600 million years old). The rest of the surface is covered with sand and alluvial deposits of Pleistocene age (less than 2 million years old). A recent volcanic activity occurred mainly in the eastern and southern parts of the continent, principally between Ethiopia and Lake Victoria. For this reason, most of the soils in Africa are characterized by a low proportion of clay, making them easy to work, but also easy to lose. Not only is Africa geologically old and afflicted with a harsh climate, but also large parts of the continent have been occupied by human beings much longer than in other continents. Human activities in obtaining food, fiber, fuel wood and shelter have, therefore, significantly altered the soil as a result of deforestation (FAO, 1985). Many African countries have already lost a significant quantity of their soils to various forms of degradation. Many areas in the continent are said to be losing over 50 tons of soil per hectare per year. This is roughly equivalent to a loss of about 20 billion tons of nitrogen, 2 billion tons of phosphorus and 41 billion tons of potassium per year. Serious erosion areas in the continent can be found in Sierra Leone, Liberia, Guinea, Ghana, Nigeria, Zaire, Central African Republic, Ethiopia, Senegal, Mauritania, Niger, Sudan and Somalia (FAO/UNEP, 1985). Though degradation is largely man-made, hence its pace is governed primarily by the speed at which population pressure mounts, irregular natural events, such as droughts, exacerbate the situation. It is a well-known fact that soil degradation not only results in decreased food production but also in ecological imbalance and consequent degradation of the quality of life. Metrological records show that unpredictability of rains is a common feature.

In the Sahel, variations in total annual rainfall can be up to 30 or 40 %. Even, the humid and sub-humid zones are subject to rainfall fluctuations of 15 - 20 %. In most cases, the rainfall is rarely gentle and even. It usually comes as torrential downpours, which are destructive to soils and harmful to plants (FAO/UNEP, 1985). It has been estimated that 319 million hectares of land in Africa are vulnerable to desertification hazards due to sand movement. An FAO (1986) assessment of land degradation in Africa suggests that large areas of countries north of the equator suffer from serious desertification problems. For example, the desert is said to be moving at an annual rate of 5 km in the semi-arid areas of West Africa. Of course, desertification did not begin with the recent drought. Archeological records suggests that Africa's arid areas have been getting progressively drier over the past 5000 years, what is new is the coincidence of drought with increasing pressures put on fragile arid and semi - arid lands by mounting numbers of human population and livestock (FAO, 1986). Deforestation exposes the soil to high temperatures which breakdown the organic matter, increase evaporation and make the soil vulnerable to erosion. About 37 million hectares of forest and woodlands in Africa are said to be disappearing each year (FAO, 1986). More serious still is the gradual removal of trees in farms, which are crucial for protecting productive land from erosion. FAO (1985) study of the carrying capacity of land in developing countries compared Africa's projected future population with its food production potential. More than 50% of the land surface of the developing countries is situated in the arid and semi-arid zones, and in many of these countries, in which more than 80% of the population lives on subsistence agriculture deforestation had adversely affected agricultural production as a result of removal of natural woody vegetation (FAO, 1981 and 1982). The value of lost forest cover in the country due to deforestation has been conservatively estimated at US $750m annually which was equivalent to about 2.3% of the GDP in 1989 (IBRD/FGN, 1994). Recently, Department for International Development (DFID) in Nigeria reported that the country loses about US $7b annually to environmental degradation (Penrose, 2005).

The combined effects of this phenomenon are the decline in agricultural production (IBRD/FGN, 1994). Cleugh and Hughes (2002) reported that shelterbelt helps prevent mechanical damage caused by high winds. Winds in excess of 8 meters per second can break off twigs and small limbs in orchard crops. Such losses of photosynthetic surface reduce production, and can adversely affect flowering and fruiting the following year. Flowers on crops are particularly susceptible to high winds, and fruits may also be damaged or dislodged. With cereal crops, stem breakage or flattening (lodging) is an increasing hazard as the crop matures. Shelter provided by windbreaks helps reduce the rate of water loss from crops through evapotranspiration; this can extend to as much as 30 times the height of the tree barrier (Konstantinov and Struzer, 1965). Reductions in wind velocity prevents adverse physiological changes in crops-such as the reductions in leaf area and photosynthetic rate that are characteristic of some crops when exposed to high winds (Whitehead, 1965). Trees and shelterbelts protect livestock, particularly young animals, against the damaging effects of both cold and hot winds. Shelterbelt provides an essential element for sand dune stabilization. Shelterbelt reduces evaporative losses from ponds, irrigation canals and other water bodies, thus making more water available to food production. By reducing wind velocities shelterbelt helps improve insect pollination of crops. This is particularly important in fruit orchards (Carborn 1965). Shelterbelt may benefit crop yields by reducing the incidence and severity of pest damage. The effects are not uniform, however, since windbreaks can harbour harmful pest species as well as pest predators (Janzen, 1976). Therefore, this study was aimed at determining the appropriate planting distance from shelterbelt, for maximum growth and yield of pearl millet in an arid area of Nigeria.

2. MATERIALS AND METHODS

Field experiment was conducted for three years in 2003, 2004 and 2005 wet seasons using an established shelterbelt plantation at Azare, Northern part of Bauchi State (Latitude 11o 40'N, Longitude 10010'E, 609. 45m above sea level) in the Sudan Savanna ecological zone of Nigeria. The site was classified as arid because of its characteristic low rainfall of short duration, and poor distribution pattern, often punctuated by periodic droughts (Marguba, 1991; Kowal and Knabe, 1972). The site recorded an average annual rainfall and temperature of 592, 361 and 862 mm, as well as 28.3, 28.6 and 30oC in 2003, 2004 and 2005 respectively. The soil of the experimental site was fine loamy sand with pH; 5.66, 6.02, 5.91, Organic carbon; 2.21, 2.17, 2.21, total nitrogen; 0.61, 0.51, 0.52, Available-P; 7.98, 8.63 and 10.6 in 2003, 2004 and 2005 respectively. The land for the experiment had previously been used for the cultivation of millet and cowpea. The same site was used for the three years of experiments.

2.1 Structure of the shelterbelt

The shelterbelts used for the study were about thirteen years old at the inception of the experiment in April 2003. They were established by the defunct Bauchi State Afforestation Project Unit, under the Forestry Directorate, Ministry of Agriculture and Natural Resources in 1990. They comprise of a network of a monoculture of Azadirachta indica and Eucalyptus camaldulensis planted in ten rows at spacing of 3m by 3m. Each belt is 30m wide, but the length varies from 1- 3m. The trees in the belt have an average height of 6m. The height was assessed by measuring the height of the tallest trees at randomized intervals along the belt using an auger altimeter and calculating the mean. The trees along the edges have never been pruned, though some branches snap occasionally. The first meter or so above the ground inside the planting has light canopy and the tree boles are fairly cylindrical. In view of the broad width of the belt the porosity could be described as medium-dense. This structure allows for through air flow at the ground level. The belts are oriented in an east-west axis so that the prevailing raining season south-west winds as well as the dry season north-east winds strike the belt obliquely at an angle of 45o. The distance between lines of belt measured perpendicularly varies from 200- 300m. Only one line of belt within the network was used for the study. The experimental plots were located at such a position that during the rainy season a stream flow of the approaching south- west winds will have to travel a distance of 300m (since the flow is oblique to the belt) before striking the study-belt, to its wind ward. The practical implication of this is that the impact of preceding line of belt in terms of effective shelter will have dwindled appreciably (if not eliminated) before the wind gets to the belt (Anon, 2003). On the leeward side the next belt is 200m away.The land was ridged in all the years of experiment using animal traction. The experimental fields, both at the windward and leeward sides of the shelterbelt were marked out into 20 plots of 5m x 5m, and a path of 5m between plots and replications was provided.

2.2 Treatments and experimental design

Millet (Gero var.) was used in all the three years of experiment. Treatments consisted of six distances (-5m, 5m, 15m, 25m, 35 and 45m) from the shelterbelt. The treatments were arranged both at the leeward and windward sides of the shelterbelt in a randomized complete block design with four replications. Treatments perpendicular to the shelter on the windward side serves as the control. One out of these control-treatments was randomly picked and designated as -5m. Treated seeds of millet (Gero var.) were sown directly into the fields between 7-15th June in all the years of experiment after the establishment of regular rainfall. Spacing of 30cm along the rows and 60 cm between rows was maintained in each year of the experiment. Twelve seeds of millet were sown, these were thinned to two plants per stand at 2 weeks after sowing (WAS) during weeding. Plant heights, numbers of leaves and tillers as well as grain yield were assessed as follows:

2.2.1 Plant height

Plant height of millet was determined from six randomly selected plants within the net plots at 5, 6,7,8,9 and 10 weeks after sowing (WAS) from the base of the plant to top of the shoot using a standard graduated meter rule.

2.2.2 Number of leaves and tillers

Numbers of leaves and tillers were sampled as in plant height, and determined by visual counting of fully developed leaves and tillers their mean values recorded.

2.2.3 Grain yield

Grain yield of millet per plot was determined by threshing panicles harvested from the net plots and converted into kg ha-1.

2.3 Data analysis

Data collected were subjected to analysis of variance (ANOVA) for significant differences of the treatments using Minitab (Minitab Inc. Pa., 1994). Means of treatments were compared using Duncan multiple range test (DMRT), calculated only when the analysis of variance (F-test) was significant at P = 0.05 (Duncan, 1955).

3. RESULTS

3.1 Plant height

Plant height of pearl millet was significantly affected by planting distance away from the shelterbelt in 2003, 2004 and 2005 (Table 1). Plant height increased significantly with planting distance up to 25m in the three years of experimentation, except at 6 and 7 WAS from 5 to 15m and 8 WAS from 5 to 25m in 2003, similarly at 5 WAS from 5 to 15m and 10 WAS from 15 to 25m of the leeward side of the shelterbelt in 2004. Plant height also decreased significantly in the three years of experimentation at all WAS from 35 to 45m from the belt, except at 5 to 8 and 10 WAS in 2003, 6WAS in 2004 as well as 6 to 8 WAS in 2005. Planting millet at -5m on the windward side from the shelterbelt produced the shortest plants in all the 3 years.

3.2 Number of leaves

Millet leaf number increased significantly with planting distance away from the shelterbelt in all the years under consideration (Table 2). Generally the leaf number increased significantly from -5m up to 25m away from the shelterbelt except at 5 to 10 WAS from 5m to 15m distance in 2003 and 5 to 6 WAS in 2004 including 5 to 6 plus 8 and 10 WAS in 2005 and then decreased significantly thereafter up to 45m away from the shelterbelt. Planting millet at -5m on the windward side from the shelterbelt produced the shortest plants with less number of leaves in all the 3 years.

3.3 Number of tillers

Number of tillers per plant was significantly influenced by planting distance away from the shelterbelt in 2003, 2004 and 2005 (Table 3). Number of tillers increased significantly with distance up to 25m in all the periods of experimentation except at 10 WAS between the control plot in the windward side of the belt and 5m on the leeward side, more so, at 5 to 10 WAS from 5m to 15m and at 5 and 10 WAS from 15m to 25m away in 2003. Beyond 25m, number of tiller decreased significantly except at 5 to 6 and 10 WAS from 25m to 35m as well as from 35m to 45m in 2003. Similar trend was observed in 2004, however at 5 to 10 WAS from 5m to 15m, and 6 WAS from 15m to 25m in addition to 5 to 7 WAS from 25m to 35m and 5 WAS from 35m to 45m were not significantly different. Number of tillers continued to decrease significantly beyond 25m away from the shelterbelt in 2005, but at 6 to 10 WAS from 5m to 15m, 8 WAS from 25m to 35m and 6, 9 as well as 10 WAS from 35m to 45m were also not significantly different. Planting millet at -5m on the windward side from the shelterbelt gave the less number of tillers in all the 3 years.

3.4 Grain yield

The grain yield of pearl millet was significantly affected by distance away from the shelterbelt (Table 4). Grain yield increased significantly up to 25m, and then decreased significantly up to 45m. Grain yield was observed to be similar from 5m to 15m as well as from 35m to 45m away from the belt in 2003 and 2004. The highest yield was obtained in 2005, while the lowest, though significantly higher the control treatment was recorded in 2004.

4. DISCUSSION

The performance of millet, based on data obtained from 2003 – 2005 showed that shelterbelt had a significant ($P = 0.05$) influenced on growth and yield characters of pearl millet. The results obtained showed that plant height, numbers of leaves and tillers increased significantly ($P = 0.05$) with distance away from the belt. It can be observed that close to the belt, particularly at the range of 5 to 15m away, these growth indicators were depressed. At about 25 to 35m distances in all the three years experimentation, the same growth characters were at their maximum with values more pronounced compared with the rest of other distances away from the belt under study. Invariably this showed that 25 to 35m is the sheltered zone; so that the crop grows higher and leafier as a result of shelter from the wind. Cleugh (2000) also reported that the sheltered zone stretched downwind from the competition zone out to about 20 shelterbelt heights. Further distances away from the belt, precisely from 35 to 45m in 2003, 2004 and 2005 also gave higher values above the ones recorded from 5 to 15m respectively. However, pearl millet crop response to growth with regards to distance from 5 to 45m away, all together responded better with higher values compared with unsheltered control plots. Exception to this being recorded under number of tillers at various sampling periods in 2003, 2004 and 2005 respectively. This characteristic behaviour of pearl millet sown either in the control plots without shelter or close to the belt was anticipated. The most likely reasons for this may not be unconnected with the fact that pearl millet sown in the control plots, near the belt (at 5 to15m) or far away from the belt (at 35 to 45m) suffered severally in different ways in the present study. Probably due to wind speed that was observed to have caused a variety of damages to the crops both at the control plots that were unsheltered, and sheltered but sown far away at a distance of 35 to 45m from the belt. The activity of wind speed to cause direct damage to growing crops was also reported by Cleugh and Hudges (2002) and Cleugh (2000). Near the belt, growth characters were suppressed likely due to shading and competition for soil moisture and nutrients between the neem trees in the shelter and adjacent pearl millet stands. This is also in agreement with the findings of Sudmeyer et al. (2002).

In addition, the neem trees in the shelter were observed to give out gums as exudates which are washed continually by rainfall, including the neem leaves that falls as litter and are decomposed and leached also by rainfall. These in combination might have led to a certain reaction within the vicinity of the shelter that could be allopathic to other crop plants growing near them. In any case, this is a natural phenomenon which occurs whenever a non-woody plant grow near or under a woody plant. This finding was supported by Boldes et al. (2002) who reported that several compounds have been isolated from neem that could have allopathic effect on growth of the adjacent crops. The grain yield increased significantly ($P = 0.05$) at different distances from the shelterbelt in all the years of study. Conversely, at the unsheltered control plots, grain yield appeared to be depressed in all the years of experiment. A similar trend of report was also forwarded by Michels et al.(1998). Possible reasons for these similarities may be probably due to similarities also in climatic conditions of the two areas and crop variety used. The unsheltered control plots were observed to be subjected to direct effect of wind speed, which in turn might have affected the growing conditions that would determine the final grain yield of the adjacent crops. A related study conducted by Boldes et al. (2002) also supported this idea. Their report which revealed that shelterbelt enhanced the wheat grain yield of the protected plant agrees with the current findings.

5. CONCLUSION

Distances measured at various point from the shelterbelt significantly influenced plant height, number of leaves, number of tillers and grain yield of pearl millet. Of all the distances evaluated, significantly higher millet yield was obtained at 25m. Therefore it is recommended that for maximum yield, planting in shelterbelt should be 25m away. It is also recommended that additional trials should be carried out on other crops such as groundnut, sorghum, maize, cowpea or vegetables to determine their responses at distances near or further away from the belt.

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Table 1: Effect of distance from the shelterbelt on the plant height (cm) of pearl millet from 2003-2005 wet seasons at Azare

Distance	**Plant height (cm)**					
	Weeks after sowing					
	5	**6**	**7**	**8**	**9**	**10**
			2003			
-5	10.6d	11d	31.3c	56.0b	97.8d	156.8e
5	14.9c	26.0c	53.4b	69.7ab	146.9c	190.4d
15	15.5b	28.3c	54.0b	71.6a	151.2bc	199.9cd
25	16.3a	42.9a	63.8a	75.0a	164.6a	242.3a
35	15.7b	31.1b	54.6a	88.8a	156.4a	216.2b
45	15.6b	30.2bc	54.5ab	84.4a	101.5d	212.4bc
SE±	0.15	2.98	3.12	7.7	1.91	4.39
			2004			
-5	12.8d	24.8e	32.7e	30.7cd	101.4e	120.0d
5	14.8c	30.4d	47.1d	73.1e	129.4d	164.8c
15	14.8c	33.3cd	51.3cd	80.1de	135.3cd	225.3a
25	16.2a	40.5a	60.0a	97.5a	169.5a	225.3a
35	15.9b	35.5b	57.3ab	91.3ab	153.6b	200.1b
45	15.3bc	34.7bc	53.7bc	84.8bc	143.9bc	182.1bc
SE±	0.21	1.58	1.45	2.65	3.77	5.9
			2005			
-5	10.9e	10.9e	24.1e	59.7e	137.7e	160.7e
5	14.4d	32.0d	47.5d	77.7d	146.8d	201.5d
15	14.9cd	33.6cd	52.0c	86.0c	152.4c	207.7cd
25	16.6a	38.5a	59.8a	93.8a	160.8a	232.5a
35	16.0ab	35.1b	55.1b	89.6b	159.3a	214.8b
45	15.4bc	34.1bc	54.3bc	88.7bc	154.9b	212.4bc
SE±	0.22	1.04	1.23	1.37	1.58	2.06

Means followed by common letter(s) are not significantly different at 5% probability level (DMRT)

Table 2: Effect of distance from the shelterbelt on the number of leaves of pearl millet from 2003 - 2005 wet seasons at Azare

Distance	**Number of leaves**					
	Weeks after sowing					
	5	**6**	**7**	**8**	**9**	**10**
			2003			
-5	2.0c	3.0d	3.0d	4.0d	5.5d	4.8e
5	3.3b	4.0c	5.0c	6.0c	8.5c	7.5c
15	3.3b	4.0c	5.0c	6.0c	8.5c	7.5c
25	4.5a	6.0a	7.3a	9.3a	12.5a	11.5a
35	3.8b	4.8b	5.8b	6.8b	9.8b	8.8b
45	3.5b	4.3c	5.3c	6.3c	9.3b	8.3bc
SE±	0.17	0.14	0.16	0.16	0.62	0.23
			2004			
-5	3.0c	3.0c	3.0e	3.8d	6.5e	5.5e
5	3.0c	3.3c	4.0d	5.8c	8.3d	7.3d
15	3.0c	3.5c	5.0c	6.5bc	9.0c	8.0c
25	4.0a	5.3a	6.8a	9.3a	12.5a	11.5a
35	3.5b	4.8ab	5.8b	7.0b	10.0b	9.0b
45	3.0c	4.3b	5.3bc	6.5bc	9.8b	8.8b
SE±	0.12	0.24	0.22	0.29	0.19	0.19
			2005			
-5	3.0c	3.8c	4.0e	5.5d	7.0d	5.5e
5	3.0c	4.0bc	5.5d	7.3c	9.8c	8.3d
15	3.0c	4.0bc	5.8c	7.3c	10.5c	9.0cd
25	4.0a	5.0a	8.0a	11.3a	13.5a	12.3a
35	3.5b	5.0a	7.3b	9.8b	12.3ab	10.5b
45	3.0c	4.3b	5.5d	7.5c	10.8bc	9.0cd
SE±	0.12	0.14	0.23	0.43	0.52	0.37

Means followed by common letter(s) are not significantly different at 5% probability level (DMRT)

Table 3: Effect of distance from the shelterbelt on the number of tillers of pearl millet from 2003-2005 wet seasons at Azare

Distance	**Number of tillers**					
	Weeks after sowing					
	5	**6**	**7**	**8**	**9**	**10**
			2003			
-5	2.0b	2.0c	2.0d	3.5d	5.5e	5.0b
5	2.8a	3.8b	4.8c	5.5c	7.3cd	5.8b
15	3.0a	3.8b	4.8c	5.8c	7.5bc	6.5ab
25	3.0a	4.5a	7.0a	9.0a	10.5a	8.0a
35	3.0a	4.0ab	5.8b	7.0b	8.8b	6.5ab
45	3.0a	4.0ab	5.0c	6.0c	7.0d	5.3b
SE±	0.10	0.19	0.17	0.28	0.19	0.72
			2004			
-5	2.0c	2.0c	3.0d	3.0d	4.0e	4.0d
5	4.0b	4.8a	5.3c	6.3c	8.3c	7.3c
15	4.0b	4.8a	5.3c	6.3c	8.3d	7.3c
25	5.3a	5.2a	7.0a	7.8a	10.5a	9.5a
35	4.8ab	5.0a	6.5b	6.8b	9.3b	8.3b
45	4.0b	4.0b	5.5c	6.3c	8.0d	7.3c
SE±	0.26	0.25	0.18	0.17	0.16	0.14
			2005			
-5	2.0	2.0c	3.0c	3.8e	6.0e	4.3e
5	3.0	4.0b	5.0b	6.3d	8.5d	7.5d
15	3.0	4.0b	5.0b	6.5cd	8.8cd	7.8cd
25	3.0	5.3a	6.5a	10.0a	12.4a	11.0a
35	3.0	4.3b	5.5b	8.8ab	10.5a	9.5b
45	3.0	4.0b	5.0b	7.0bc	9.5bc	8.3bc
SE±	NS	0.15	0.17	0.42	0.37	0.49

Means followed by common letter(s) are not significantly different at 5% probability level (DMRT)

Table 4: Effect of distance from the shelterbelt on the grain yield ($kgha^{-1}$) of pearl millet from 2003-2005 wet seasons at Azare

Distance (m)	**Grain yield ($kgha^{-1}$)**		
	2003	**2004**	**2005**
-5	614e	649e	628e
5	1190d	1150d	1110d
15	1450cd	1300cd	1523c
25	2253a	1930a	2659a
35	1787b	1510b	2131b
45	1677bc	1360bc	1640c
SE±	135.20	105.19	94.61

Means followed by common letter(s) are not significantly different at 5% probability level (DMRT)