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Short Communication

Adaptation of mustard oilseed under Kenyan condition

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There is great potential for producing oilseed mustard as a cash crop and alternative crop for Kenya since its very early maturing (80 days) and highly adaptable. Oilseed mustard offers promise for semi-arid areas where Canola is not adapted. Its early maturity makes it an ideal break crop. The largest wheat and maize producing districts are experiencing excessive soil acidity, disease and pest problems due to continuous cropping. To alleviate this, a cheap and environmentally safe alternative crop has to be sought. During the 4 months fallow period after harvest, mustard can be seeded and ploughed in as green manure to increase the organic matter in the soil or the seed can be harvested and sold to the processors. The performance trials were conducted in two years (2002 and 2003) and comprised of 10 cultivars of oilseed mustards. These were planted at Njoro, Lanet and Naivasha in a Completely Randomized Block Design (RCBD) with 4 replicates. The seed rate was 10 kg/ha. The source of nitrogen and phosphorus was DAP mixed with the seed at 100 kg/ha during planting. Recommended agronomic practices were followed and data collected on various agronomic parameters but only the seed yield was subjected to Analysis of Variance (ANOVA). The genotypes were significantly different (P≤ 0.05) in Njoro and Lanet in 2002 and at all sites in 2003. However seed yields at Lanet were generally low compared to the other 2 sites. Five lines in Njoro (Kenmd 02, Kenmd 03, Kenmd 08, Kenmd 09, Kenmd10) ranged between 1273 and 1302 kg/ha. Kenmd 09 and Kenmd 10 yielded highest in Naivasha (1226 kg/ha) with the lowest yielder in Njoro (Kenmd 01) being outstanding in Naivasha (1389 kg/ha). Kenmd 02 and Kenmd 05 were superior in Njoro and Naivasha in 2003. The superior mustard lines have been recommended for commercial production.

Key words: Adaptation, break/exhaust crops biofumigation, isothiocynates, agroenviroments, glucosinolates.

INTRODUCTION

Many oilseed crops (e.g. sunflower, soybeans, rape-seed/mustard, sesame, groundnuts etc) can be grown in Kenya. Incorporating mustards as a break crop in the cereal based cropping systems is expected to trap many diseases and insect pests and increase yield of wheat and other cereals.

It is unlikely that new land will be set aside for oilseed production in the predominantly cereal growing areas of Kenya. Use of break crops is a sustainable way of maintaining soil fertility thus improving chemical and physical properties of the soil while controlling pests and diseases. This increases productivity and maximizes on agricultural investment. There is great potential for producing oilseed mustard as a cash crop and alternative crop for Kenya since its very early maturing (80 days) and highly adaptable. For a crop to be well adapted it must be capable of exploiting both its physical and biological environments and be able to remain productive under pest and disease pressure (Hawtin et al., 1996). The adaptation of a crop, its ability to survive in a particular environment and to exploit its various features productively is extremely complex and under genetic control. In formal systems, breeders are generally concerned with adaptation in one or three ways: 1) to develop cultivars which are better adapted to agro – environments in which the crop is currently produced 2) To develop cultivars better adapted to new agro - environments (geographic areas or farming sys-tems), 3) To broaden adaptability in order to develop cultivars that are competitive over large areas and in the hope they will exhibit greater stability across seasons. Its early maturity

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Table 1. Mustard yield at 3 locations in kg/ha, 2002.

Line	Njoro	Naivasha	Lanet
Kenmd - 01	779.7c	1389.0	662.2b
Kenmd - 02	1302.1a	809.7	**769.7ab**
Kenmd - 03	1302.1a	948.6	759.8ab
Kenmd - 04	954.8abc	946.6	767.9ab
Kenmd - 05	1099.5abc	786.1	**814.4a**
Kenmd - 06	998.3abc	833.3	378.3c
Kenmd - 07	868.0bc	601.4	415.7c
Kenmd - 08	1273.1ab	879.2	700.0ab
Kenmd - 09	1302.1a	1226.4	669.3b
Kenmd - 10	1273.1ab	1226.4	674.4b
CV %	25.18	35.8	12.43
LSD (= 0.05)	352.1	NS	95.40

Within each column, means followed by the same letter are not significantly different (P≤ 0.05).

Table 2. Mustard yields at 3 locations in 2003 (kgs/ha)

Line	Njoro	Naivasha	Lanet
Kenmd – 01	698.2abc	811.4c	648.2c
Kenmd – 02	985.1a	1012.6ab	654.6c
Kenmd – 03	702.7abc	893.6bc	795.9a
Kenmd – 04	681.2ab	931.7bc	722.5abc
Kenmd - 05	851.5a	994.3ab	688.0bc
Kenmd - 06	549.6cb	327.9d	368.5d
Kenmd - 07	418.9c	364.1d	378.4d
Kenmd - 08	860.5ab	1091.8a	651.5c
Kenmd - 09	722.7abc	901.8bc	737.7abc
Kenmd - 10	891.2a	816.5c	779.6ab
CV %	30.33	11.88	11.28
LSD (= 0.05)	267.18	112.31	84.16

Within each column, means followed by the same letter are not significantly different (P≤ 0.05).

makes it an ideal break crop. Every crop suffers from a number of diseases caused by fungi, reduce yield. To stabilize agricultural production, bacteria viruses and nematodes, all of which managing insect pests that ravage the crops and drastically reduce yields is a must. The brassicas are known to control root disease by biofumigation (Angus *et al.,* 1999). This term is given to inhibition of pathogens by compounds release-ed by root residues. Isothiocyanates (ITCs) are the major group of biologically active compounds that cause biofu-migation. They are formed from the hydrolysis of glucose-nolates (GSLs) when the plant is injured or matures. Root diseases are easily controlled when wheat is grown after a break crop such as canola, and the yield benefit to the following wheat crop has been an important contributing factor to the growth of the Canola industry (Haines *et al*., 1996).

The largest wheat and maize producing districts in Kenya are experiencing excessive soil acidity, disease and pest problems due to continuous cropping. To alleviate this, a cheap and environmentally safe alternative has to be sought. During the 4 months fallow period after harvest, mustard can be seeded and ploughed in as green manure or harvested seed sold to the processors.

Mustards are early maturing (take 80 to 90 days) to attain physiological maturity. Due to the deep rooting system and high water use efficiency, oilseed mustard have an advantage over the other crops in the marginal rainfall areas. Mustards are more resistant to insect pests and diseases than rapeseed (canola) and their early maturity makes them ideal break/relay crops in various cereal based cropping systems. Other added advantages are: mustards possess an inherently higher yield potential than rapeseed, grow well in a variety of soils including those high in salinity and are more tolerant to shattering. The objective of this study was to develop mustard cultivars adapted to new agroenviroments (geographic areas or farming systems) in Kenya.

MATERIALS AND METHODS

This study was carried out in Njoro, Naivasha and Lanet for 2 years, that is, 2002 and 2003. The experimental design was a completely randomized block design with four replicates. The plot size was plot consisted of 8 rows of 6m long DAP at 100 kg/ha was mixed with the seed at planting and seeded at 10 kg/ha. Pre-emergent herbicide (lasso EC) was applied to control the weeds. This was supplemented with manual weeding. Insect pests were controlled, as they appear using recommended insecticides. Data was collected on various agronomic parameters but analysis of variance (ANOVA) was carried out only on seed yield and the means separated by Least Significant Difference (LSD) (P≤ 0.05).

RESULTS AND DISCUSSION

Cultivars were significantly different in Njoro and Lanet in 2002 (Table 1) however yields at Lanet were generally low compared to the other 2 sites. Five cultivars in Njoro (Kenmd – 02, Kenmd – 03, Kenmd – 08, Kenmd – 09, Kenmd – 10) ranged between 1273 kg/ha and 1302 kg/ha. Kenmd – 09 and Kenmd – 10 yielded highest in Naivasha (1226 kg/ha). The lowest yielder cultivar Kenmd-01 in Njoro was the outstanding cultivar in Naivasha (1389 kg/ha).

Insect pest damage was greatest when conditions were dry but these were effectively controlled. Due to availability of rain, the mustard lines did not mature early hence this contributed to the high yields in Njoro and Naivasha. Conditions in Lanet were drier than the other two sites. The genotypes were significantly different (P< 0.05) in seed yields at all sites in 2003 (Table 2). Kenmd – 02 Kenmd – 05 were superior performers in Njoro and Naivasha. Mustards could form good break/exhaust crops in the predominantly cereal growing areas due to their early maturity. Yields are comparable to rapeseed when moisture is not limiting. Considering the fact that oil

seed mustard is tolerant to acid soils, there is need for more widespread testing. Based on this data, stability of the lines for either specific or broad recommendations can be determined. Genetic diversity studies should be initiated so as to identify germplasm for use in the breeding program. Bulking of breeders' seed should be enhanced. Five cultivars Kenmd – 02, Kenmd – 03, Kenmd – 08, Kenmd – 09, Kenmd – 10 were outstanding in seed yield and are recommended for seed bulking.

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